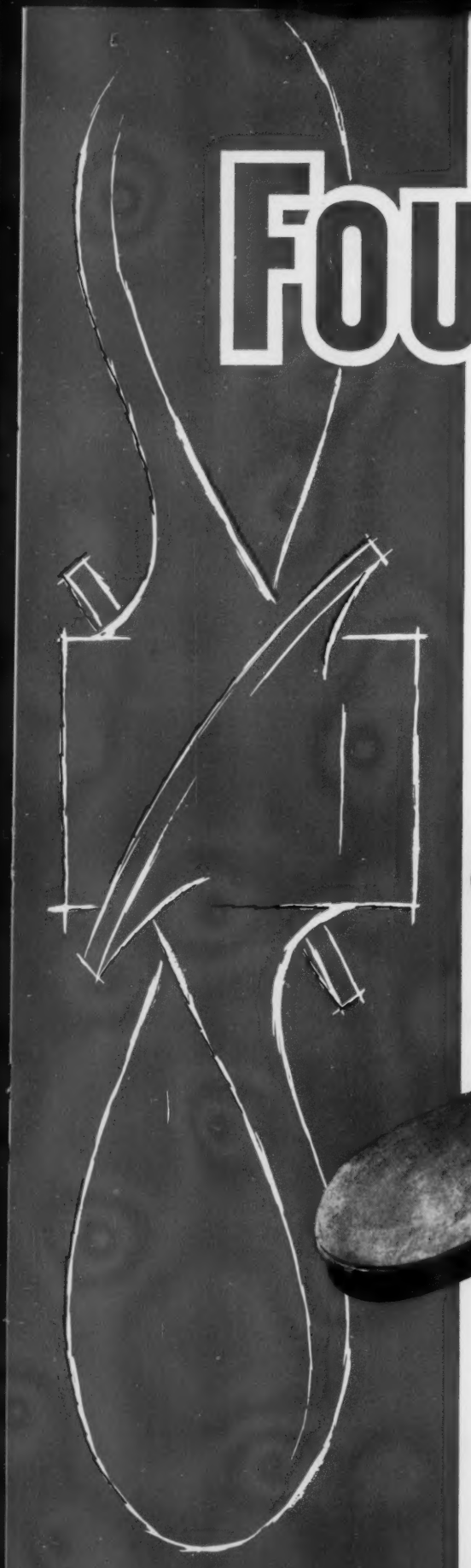
JUNE 1958

FOUNDRY

A PENTON PUBLICATION



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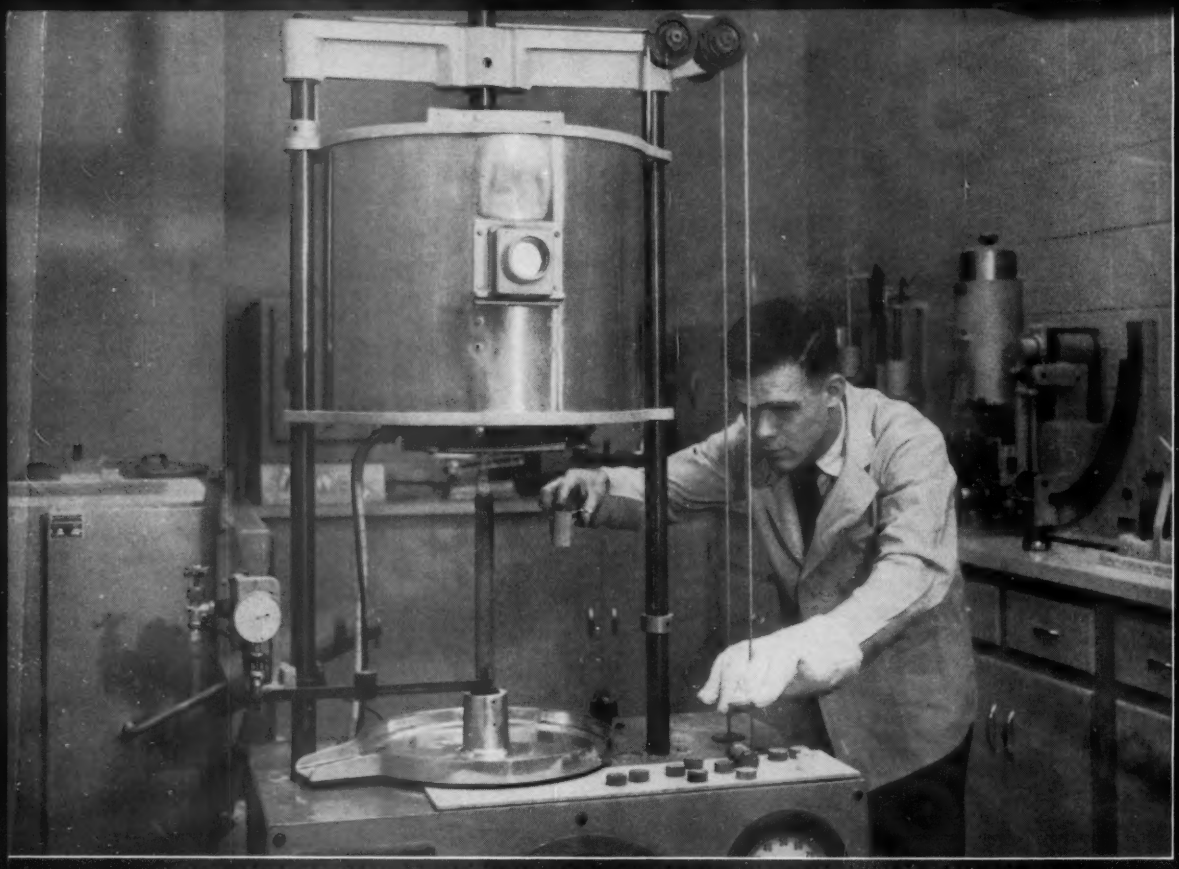


At Magcobar's Des Plaines, Illinois, laboratory, A. H. Zrimsek uses modern methods for foundry sand research.

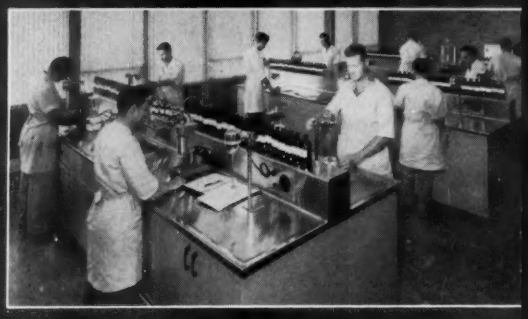
SCIENCE and SAND

. . . Recipe For Progress

In new laboratories at Des Plaines, Houston and Greybull Magcobar technicians are busy with silica, bentonite, water and a host of other ingredients, taking the guesswork out of sand formulas. Applying modern research methods, these scientists are *proving* the "hows" and "whys" of foundry sand practice.

Magcobar invites the technical and research groups of the American Foundries to use Magcobar facilities for the solution of various industry-wide problems relating to sands.

Write Des Plaines for our latest foundry technical bulletins. Look to Magcobar, producers of YELLOWSTONE bentonite, for further revealing recipes for progress.



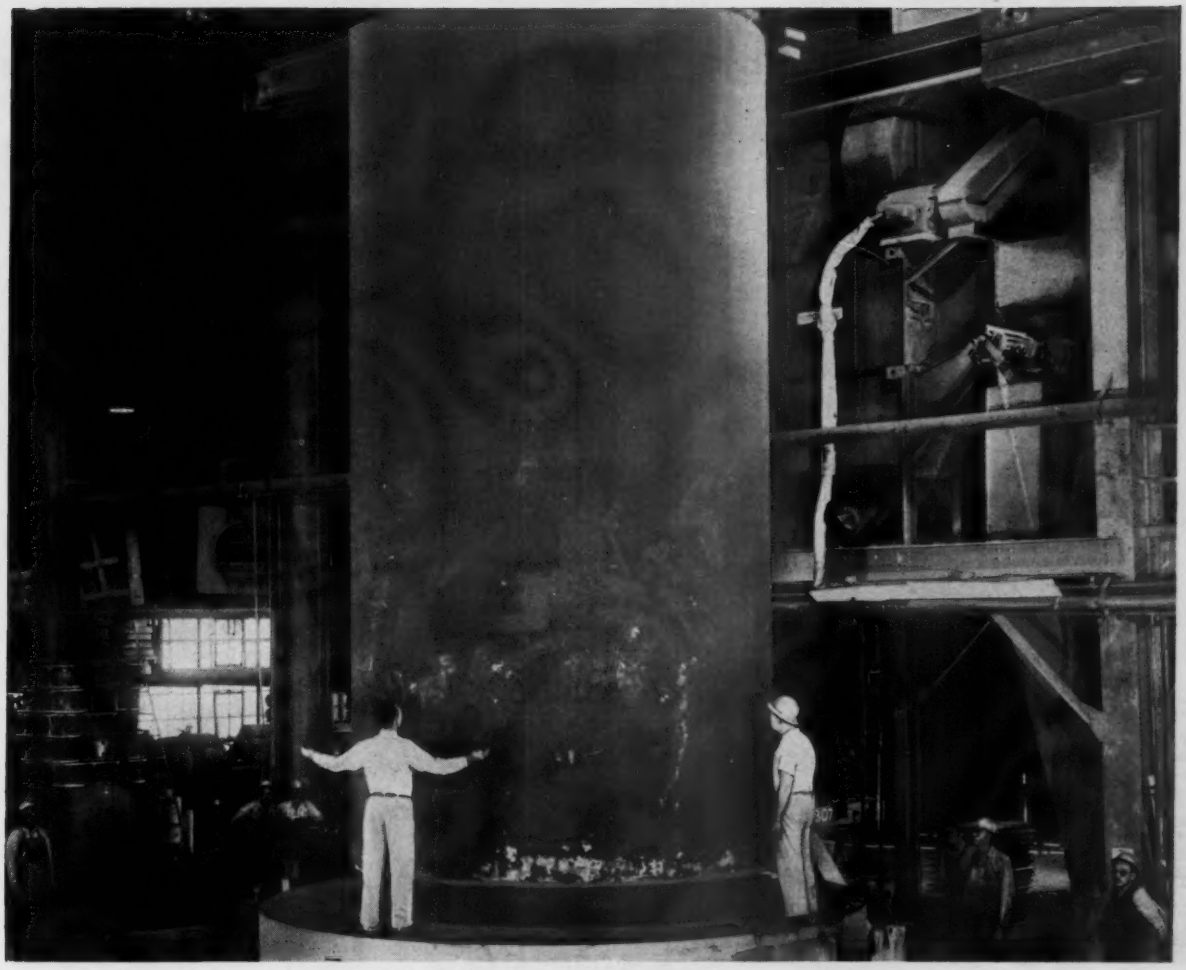
Magcobar technicians in the company's big research laboratories in Houston strive for constant improvement of Magcobar products.

This Magcobar plant at Greybull, Wyoming, where YELLOWSTONE is mined and processed, is the world's largest producer of bentonite, and includes a complete quality-control laboratory.

Magcobar
YELLOWSTONE
BENTONITE

MAGNET COVE BARIUM CORPORATION

Des Plaines, Illinois, 576 Northwest Highway
Houston, Texas, P. O. Box 6504
Greybull, Wyoming



40-Ton Dryer Roll being removed from the mold at Newport News Shipbuilding and Dry Dock Company, Newport News, Virginia.

How nickel cast iron helps take the risk out of large castings

Here's a Yankee dryer roll for example. It weighs 40 tons. Length: 262 inches. Diameter: 12 feet.

It's just too big to take a chance. The foundry can't afford a reject. Especially when a reliable metal can assure pressure tightness... ample strength... a smooth surface... and easy machining.

Nickel cast iron assures a sound casting through uniform metal structure

Nickel irons combine fine graphite in a uniform matrix. They promote strength and rigidity, and a surface free of imperfections.

Because of these properties Newport News specifies a nickel cast iron for these rolls. Even with today's high steam pressure this nickel cast iron dryer roll will stay pressure tight. It's definitely not a leaker. Its surface, thanks to nickel cast iron, is uniform and smooth.

The roll easily meets the strength levels required by the boiler code. The basic 1.34% nickel iron composition achieves 40,000 minimum tensile strength every time.

And Newport News needs nickel cast iron to get the high polish, mirror-like finish required on the roll. Uniform structure and the absence of carbides and defects afford a readily machined and polished roll.

You, too, can get this dependability in heavy iron castings – or in light ones that need high strength, pressure tightness and good machinability. Nickel cast irons are quality castings. And quality castings are good business ... for you, and for your customer.

For assistance on specific composition problems, contact Inco. Our engineers will gladly provide the metallurgical information you want.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

INCO TRADE MARK

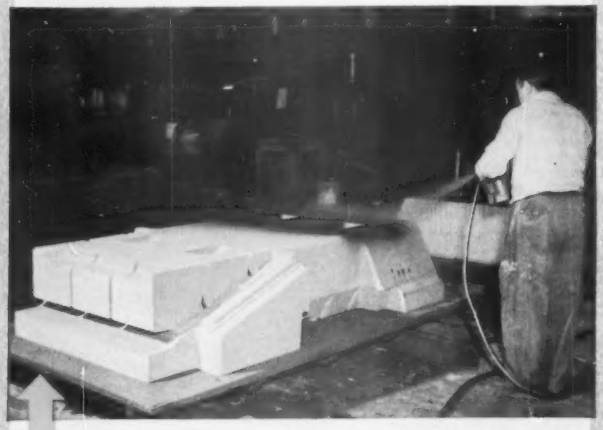
NICKEL CAST IRONS

BEST FOR YOU BECAUSE THEY'RE BEST FOR YOUR CUSTOMERS

HILL-ACME
reports on value of...

John Makren and Joe Zargel, coremakers at Hill-Acme are stripping the box from a 3000-lb. LIN-O-SET core which is typical of much of the core work in this modern foundry. Two of these giants form the core assembly for a 3½-ton machine tool base pan casting. Note the delicate undercut on the left side of the core, which involved considerable time and trouble prior to the use of LIN-O-SET.

Otto Spirek, plant superintendent at Hill-Acme, discusses mixing procedures with Dan Chester, ADM Technical Service Mgr., who makes periodic checks on procedures, and stands ready to apply his specialized knowledge to core problems as they arise.



Hill-Acme castings are known for their excellent finish. They attribute this to high density of LIN-O-SET cores, and the use of FEDERAL No. 801 PLUMBAGO COREWASH. Illustration shows Paul Colella spraying on FEDERAL No. 801.

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LIN·O·SET

½ the fabricating time
½ the baking time

...and vastly improved casting finish. These are the primary reasons why HILL-ACME COMPANY of Cleveland, Ohio, switched from conventional core oil to LIN-O-SET.

Larry Rayel, ADM Representative, suggested that Hill-Acme try LIN-O-SET as an experiment. The huge, complicated cores presented constant problems: for instance, they had to use back-up sand to reinforce delicate undercuts; it was difficult to hold dimensional stability and at the same time attain sufficient flowability for easy ramming; they had to "baby" green cores due to their extreme size and weight; then the large cores had to bake for two nights.

After a demonstration by ADM Technical Service Manager, Dan Chester, it was decided to put LIN-O-SET into the entire core operation.

Now, a year later, these are the recognized benefits: after a short air-curing period, core boxes are stripped faster and easier without danger to the core, and the core has absolutely no sag after stripping; there is less need for rodding; high green strength of the cores as drawn permits safer handling, reducing green core breakage; minimum ramming and tucking are required due to low green strength and high flowability of LIN-O-SET sand as discharged from the muller. All in all, total fabrication time for LIN-O-SET cores is estimated to be at least 50% less.

Baking time was reduced from two nights to one night. Excellent collapsibility of the cores reduces cleaning to a minimum.

Perhaps a demonstration of LIN-O-SET in your foundry will bring about attractive savings for you. Write for LIN-O-SET technical bulletin.

Archer QUALITY

Archer·Daniels·Midland company

FEDERAL FOUNDRY SUPPLY DIVISION

2191 West 110th Street • Cleveland 2, Ohio

Aim toward better castings through the use of Archer Quality Supplies:

GREEN BOND H-J High-gelatinating Bentonite	**FEDERAL** Sand Stabilizer	**LINOIL** Core Oils	**ADMIREZ** Foundry Resins
GREEN BOND L-J Low-gelatinating Bentonite	**FEDERAL** Core Washes	**INDUCTOL** Fast-baking Core Oils	**ADCOSIL** CO_2 Binders
CROWN HILL Sea Coal	**FEDERAL** Plumbagos	**LIN-O-SET** Air-setting Core Binders	**LIN-O-CEL** Sand Stabilizer
	FEDERAL Core Pastes		**FRE-FLO** Parting Compound

FOUNDRY

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June 1958

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(For addresses of branch offices, see Page 193)

FOUNDRY is edited primarily for management, production, technical, and purchasing personnel in foundries. A copy is sent at no cost to each metal casting plant in the U. S. and Canada employing 20 or more workers and to selected smaller foundries. Additional copies are sent to each foundry to the extent necessary to serve all key foundry personnel on a personal or routed basis. A limited number of copies is supplied at no cost to educational institutions.

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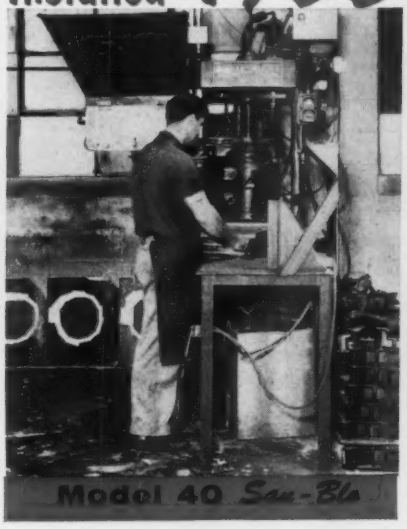

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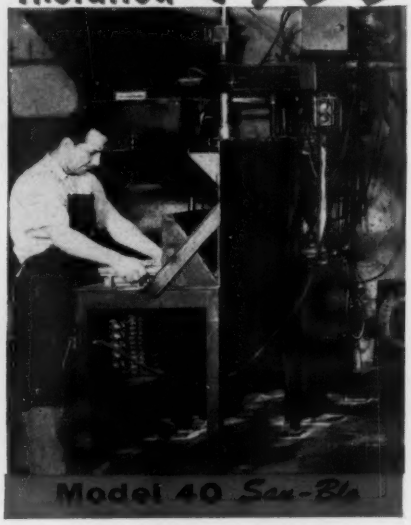


History Repeats Itself on Solon Foundry's San-Blo® Line!

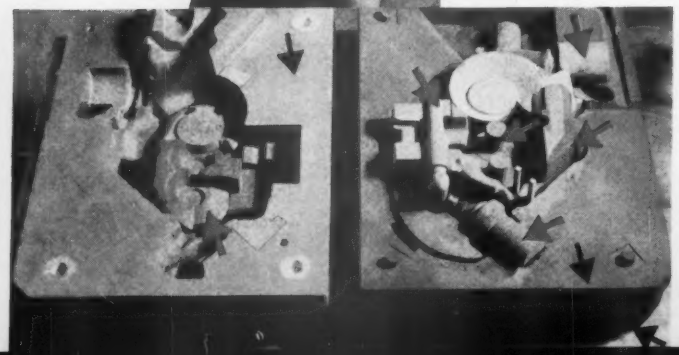
Here is how Ernie F. Locsei, Core Room Superintendent at Solon Foundry, Inc., Solon, Ohio, relates the story:

"Every time we add a SAN-BLO Core Blower, we boost our production rate and capacity, improve our accuracy, reduce scrap, and expand our flexibility. Often, the addition of a SAN-BLO has meant three times more cores produced in the same period over hand ramming."

"No wonder we're even blowing some of our precision aircraft core work."

"The big step was taken last year when we installed our "155" SAN-BLO, the machine that let us project our small core experience into big cores and dry sand molds."

"No trouble meeting production schedules now!"



The matched core assemblies shown at the left are for aircraft gear pump housings. Sixteen cores make up the assembly; seven are blown on the SAN-BLO machines illustrated. The green arrows point to cores blown on Model 40 SAN-BLO machines, and the black arrows indicate the dry sand molds blown on the "155" Model.

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manufactured by San-Blo Department.....

Modernize with a "155"

. . . featuring a new, stationary sand chamber, located directly under the sand supply hopper. A shuttle type cut-off automatically opens and closes for refilling, *quickly*, after each blow. This design eliminates the need for movement of large, heavy parts during the refilling of the sand chamber and assures perfect alignment of blow plate and table, for accurate drawing.

The "155", of course, also has the exclusive SAN-BLO design sand chamber with motor-driven agitator and "aerating" blow circuit, which makes possible the blowing of *light or heavy* sand mixes and the blowing of cores weighing from a few pounds to full capacity of machine – with *equal efficiency*. The "155" also has single-pushbutton, automatic controls for clamping, blowing, drawing and refilling operations – including flow and refill timers.

Versatile "155" blows heavy or light sand mixture in metal, wooden or plastic boxes.

OPTIONAL EQUIPMENT (SAN-BLO exclusives!)

PULSATOR TYPE BLOW – for blowing wooden core boxes.

LOW PRESSURE PREFILL – for minimizing core box wear.

QUICK-CHANGE BLOW and VENT PLATE ASSEMBLY – for minimizing costly change-over time and rigging of open top core boxes.

Archer QUALITY

Archer Daniels Midland company

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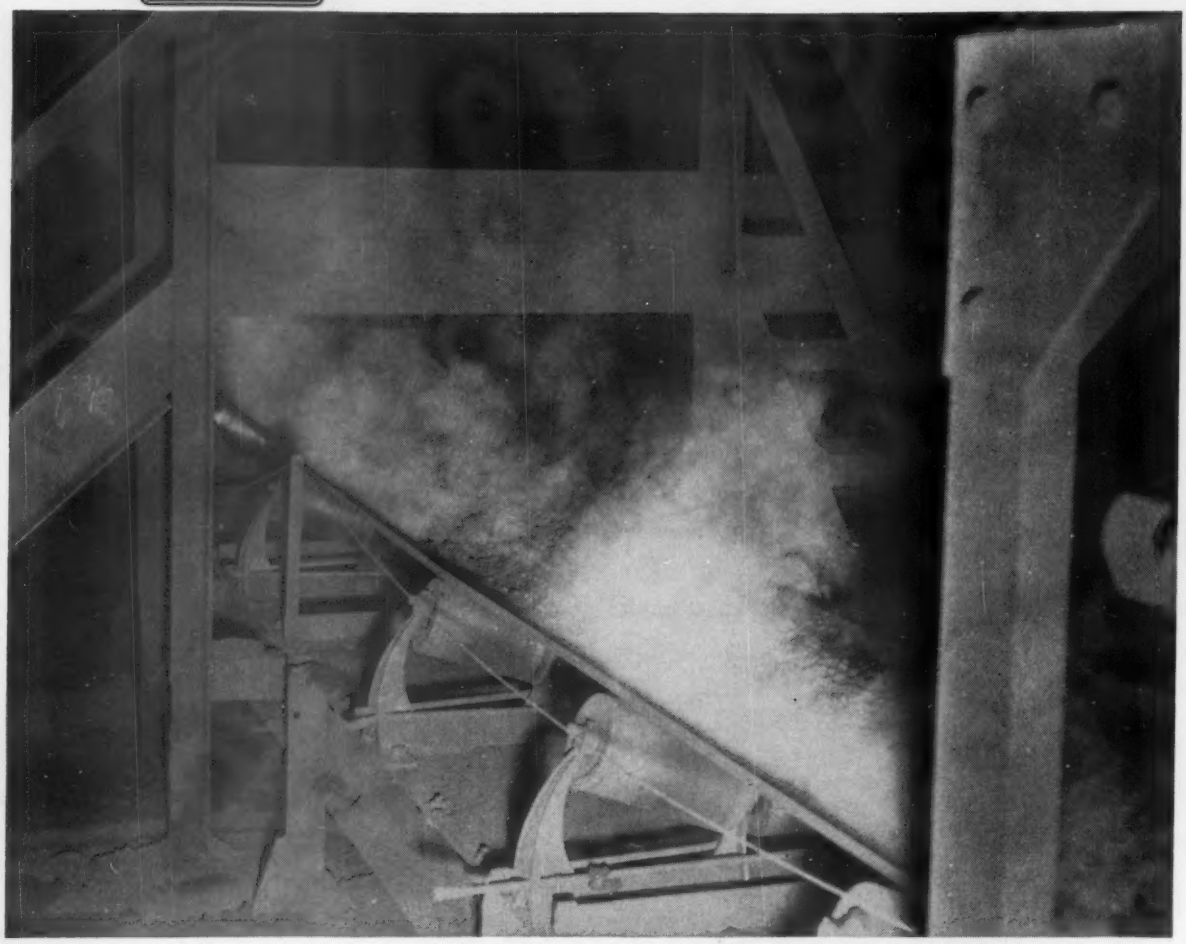
B.F.Goodrich



Hot iron clinkers burned out belt in 4½ months

B. F. Goodrich improvements in rubber brought extra savings

Problem: At this steel mill ore fines are sintered, then sent on their way to the blast furnace on a conveyor belt. But these iron clinkers are extremely hot, with rough, jagged edges. They baked the belt hard, cut into it, made it crack and break. The belt needed constant repairs, had to be replaced every 4½ months.

What was done: When a B. F. Goodrich salesman heard of the problem, he suggested a new belt, called Solarflex, specially designed by B. F. Goodrich engineers to handle hot materials. This belt is made of a special rubber that stays soft and pliable at temperatures that cause other belts to harden and crack and finally break down.

Savings: The B. F. Goodrich belt lasted 7 months—2½ months longer than previous belts. Company officials were so impressed they standardized on Solarflex belts for this conveyor system.

Extra benefits: Because the B.F.Goodrich Solarflex belt stays flexible even when exposed to high heat, it not only lasts longer than other hot-material belts, but also reduces maintenance costs because it holds fasteners better.

Where to buy: Your B.F.Goodrich distributor has the exact specifications on the belt that solved the problem in this steel mill. And, as a factory-trained specialist in rubber products, he *can* answer your questions about *all* the rubber products B. F. Goodrich makes for industry. *B.F.Goodrich Industrial Products Company, Dept. M-337, Akron 18, O.*

B.F.Goodrich *industrial products*

Circle 556 on Page 117

How much money can you really save using

Coleman Transrack Ovens

COLEMAN OVENS

in your core department?

Performance records in all classes of foundries prove that Coleman Ovens reduce overall core department costs by as much as 50%! In fact, many Coleman Ovens pay for themselves out of savings in less than a year!

Coleman Core and Mold Ovens, through modern engineering and more than half a century of specialized foundry experience, have an outstanding record for reducing scrap losses, fuel, material and labor costs. The uniform heating, accurate controls and work handling methods found exclusively in Coleman Ovens are responsible for immediate improvement in cores, molds and casting quality.

Since production savings are so important to profits, it will pay you to investigate the unusual advantages of Coleman Ovens immediately. Let our experienced engineers show you how modern Coleman Ovens can pay dividends in your foundry.

As builders of the world's only complete line of foundry ovens, we have no reason to recommend any but the best oven for your purpose.

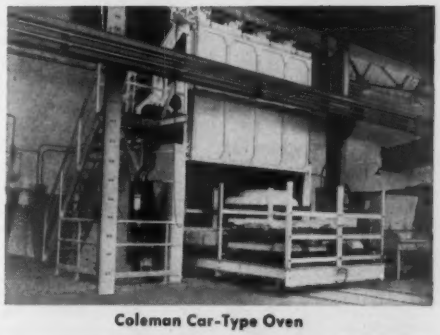
WRITE FOR BULLETIN 54

A COMPLETE RANGE OF TYPES AND SIZES:

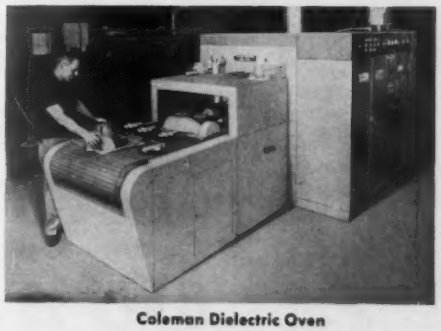
for every core baking and mold drying requirement:

Tower Ovens • Horizontal Conveyor Ovens • Car-Type Core Ovens • Car-Type Mold Ovens • Transrack Ovens • Rolling Drawer Ovens • Portable Core Ovens • Portable Mold Dryers • Dielectric Core Ovens

Coleman Tower® Oven



Coleman Car-Type Oven



Coleman Dielectric Oven

THE FOUNDRY EQUIPMENT COMPANY

1821 COLUMBUS ROAD **CLEVELAND 13, OHIO**

WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS

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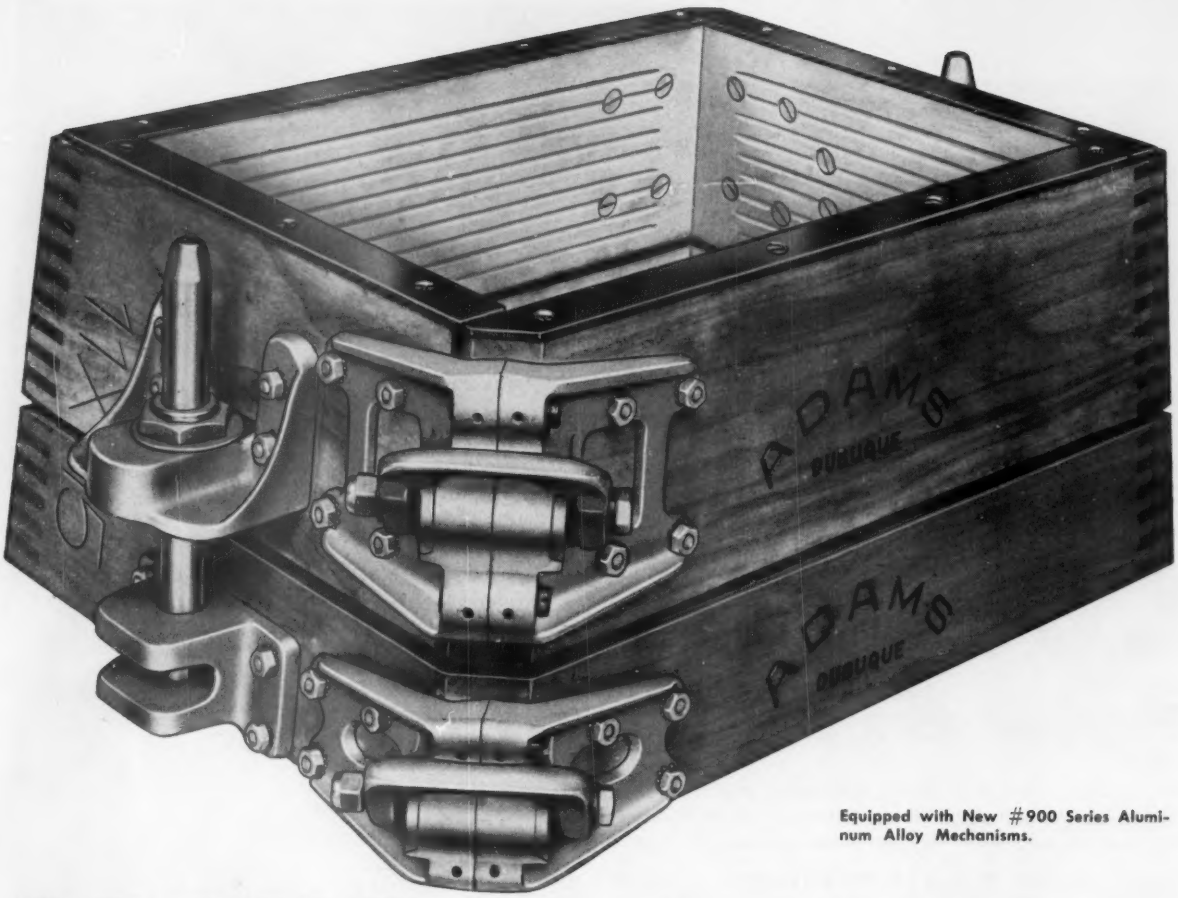


Equipped with New #900 Series Aluminum Alloy Mechanisms.

ADAMS CHERRY EASY-OFF FLASK

MAKE REAL SAVINGS FROM THESE ADVANTAGES!

CHERRY EASY-OFF FLASKS are of proven design and construction.

CHERRY LUMBER is the finest available, carefully selected and thoroughly air dried.

SIDES AND ENDS finished 1⅛" on all standard size flasks. 1¼" and heavier on flasks of larger perimeters and greater depths.

SOLID CORNERS are machine dovetailed and maintained in rigidness through dipping in "Hot Glue" and machine locking.

ALUMINUM ALLOY TRIMMINGS are also used on Adams Aluminum Easy-Off Flasks when specified.

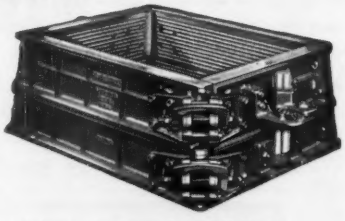
OPERATING MECHANISMS are identical with those used on the Adams Aluminum Easy-Off Flask and incorporate the same simple adjustment and reversal of locking position.

STEEL PROTECTING STRIPS are standard equipment at top, bottom and parting. Aluminum strips available upon request at no extra charge.

HANDLES AND TRUNNIONS are available when specified, Tee Iron Trusses if required.

PIN AND EAR ARRANGEMENT available to interchange with present pattern plate guides.

Did you get the Adams story last month at the 62nd Castings Congress and Show? It told you how Adams Flask Equipment meets your requirements in practically all methods of production. If you missed it, write today for Adams big profit-making catalog.



Adams Aluminum Easy-Off Flask

Adams Jackets, Cast Iron or Aluminum

The ADAMS Company

Dubuque, Iowa

1883 75 years of progress 1958

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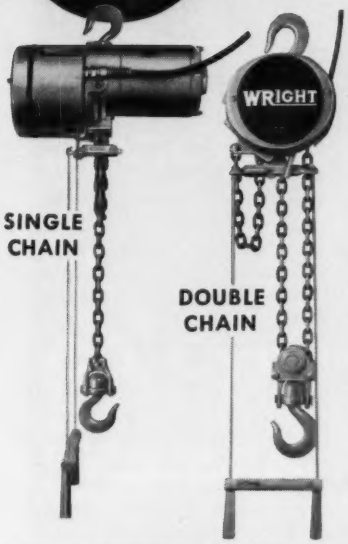
Circle 559 on Page 117→

WRIGHT HOISTS & CRANES

FOR LONGER LIFE • EASIER MAINTENANCE
LOWEST FINAL COST

ACCO



NEW...

WRIGHT Electric Chain Hoists

LIGHT - COMPACT - RUGGED - LOW COST

Two capacity ranges as pictured—
Single Chain 300 to 2000 lbs. Double Chain 3000 to 4000 lbs.

• Long Life—Safety—Minimum Maintenance are assured by these sound features: Wick Oiling of Load Chain gives a working life many times greater than dry chain...Fewest Moving Parts of any chain-type electric hoist cuts maintenance...Alloy Steel Load Chain is heat-treated for long-wearing surface, with ductile core to resist shock loads—side-pull won't break this flexible chain...Load Wheel, Hooks and Hook Couplings are drop-forged alloy steel...Precision Ball Bearings, and gears operating in oil bath, increase efficiency and lengthen life...Double Braking gives maximum Safety. Worm and Gear Drives serve as simple, positive Load Brake, and there's a big, efficient Motor Brake, easy to adjust for lining wear. For complete information, write York, Pa., for **Bulletin DH-73.**

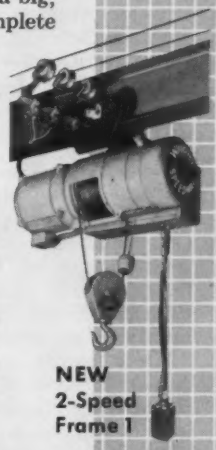
WRIGHT *SPEEDWAYS*—Capacities ¼-ton to 10 tons

FRAME 1, FRAME 1½, FRAME 2, FRAME 3

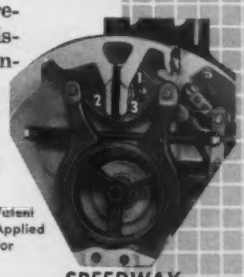
• The New 2-Speed Frame 1 WRIGHT *Speedway* pictured here has a 2-speed motor... 1800 RPM for fast lifting and lowering...450 RPM for slow, gentle positioning of production work. It's ideal for foundries and machine shops. Capacities ¼-ton to 1 ton.

WRIGHT *Speedway* features make them your best buy for production work: The Motor Brake pictured here is an outstanding feature of WRIGHT *Speedways*. It's foolproof! No adjustment for springs or solenoid ...*Nothing to Adjust but the Cam!*

Other WRIGHT *Speedway* features: Perfect balance for smooth running...NEMA 30-minute motors for heavy-duty work...best available electric controls...heat-treated alloy steel gears, pinions and shafts have hard-wearing surface, ductile cores for shock resistance...splined connections minimize distortion...precision ball or roller bearings insure efficiency, low maintenance...gears and gear shaft bearings splash-lubricated in gear housing...Weston-type load brake ...all suspensions—lug, hook, base mountings or Timken trolleys.



NEW 2-Speed Frame 1



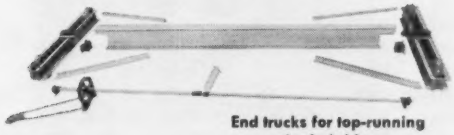
Patent Applied for

SPEEDWAY MOTOR BRAKE
Nothing to adjust but the cam!

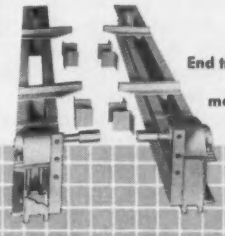
WRIGHT END TRUCKS AND CRANE DRIVE UNITS

Build Better Cranes... Save Money too!

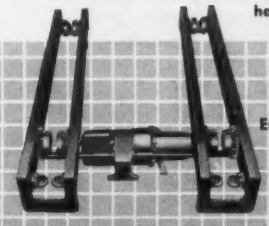
• WRIGHT Motor-Driven Cranes, Hand Traveling Cranes, End Trucks, Drive Units and Trolleys are available in a wide range of sizes and capacities to meet every overhead material-handling requirement. Write our York, Pa., office for literature and information on the equipment you need.



End trucks for top-running single-bridge hand-traveling cranes



End trucks for top-running double-bridge motor-driven cranes



End trucks and drive units for underhung cranes

Wright Hoist Division
AMERICAN CHAIN & CABLE

York, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

60 TONS

of hot castings daily

Every 16-hour day, 60 tons of castings with temperatures to 250° F. ride this Imperial Belt. The belt is Imperial* Standard Rexall—Impregnation 615 (117′ x 30″ x 5 ply)—a brand developed for the rugged requirements of this abrasive foundry service.

Long service life—Installed in 1953, this belt has been in continuous operation at the Chambers, Bering, Quinlan Co., a jobbing foundry. Such long life is the result of Imperial's superior manufacturing processes that include exclusive double stitching and special impregnating compounds.

These features are described fully in Imperial's NEW Belting Catalog and Engineering Handbook, an extremely helpful and cost-saving publication for every user of industrial belting. Use the coupon to order your copy today.

Reg. Trademark of Imperial Belting Co.

Imperial

BELTING COMPANY

1755 S. Kilbourn Ave., Chicago 23, Ill.

You expect MORE from Imperial . . . and you get MORE!

Mail this coupon today for NEW Belting Catalog and Engineering Handbook

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Circle 560 on Page 117

With the Editors

THE Challenge: "Economic Growth in the United States, Its Past and Future" has been published recently by the Research and Policy Committee of the Committee for Economic Development as a statement of national policy. The information in that report most quoted by the general press is as follows: ". . . by 1975 the disposable income of the average family—after payment of all taxes—would be in the neighborhood of $7100, expressed in dollars of 1956 purchasing power. The increase over the present family disposable income of $5300 would exceed the amount the average family now spends for food and clothing combined."

This surely indicates a broad market for the products which use castings in the end product or in the equipment to produce that product.

The prediction on growth in disposable income is followed by this thought-provoking paragraph:

"The achievement of this high average income is not an imagined utopia; it is a practicable goal for practical men. The prospect is inspiring, but it must be no less sobering for every thoughtful citizen. Only if we manage our economic affairs with intelligence can we expect such a 'good life,' on the material side shared among the entire population. That is, together with the opportunity, there is a high responsibility to bring it about. For it is quite possible to see several tendencies, some already evident and others easily imaginable, that could stop our long trend of growth."

—o—

The Drudgery Jobs: Foundrymen who have supplied castings for the various branches of the military establishment should be interested in the following from a recent talk by Admiral Arleigh A. Burke, chief of naval operations before the National War College and Industrial College of the Armed Forces:

"There is a great temptation to rush headlong into new fields where glamor holds the greater appeal. Yet the threats confronting the Free World today still demand—and they will for years to come—the kind of strength and readiness that is reflected in the trained footsoldier, the powerful missile-armed tank, the manned aircraft, and the ships at sea.

"By far the greatest number of tasks which the military services must perform are the dull ones, the routine ones, the drudgery jobs which, though not overly stimulating or newsworthy, are as vital to our national interests as ballistic and space vehicles. For the Communists are not particular about how they beat us. Wherever we are weak, that is where they will probe and take advantage of us."

—o—

Another Caine Article: Many technical people have discussed at length the provocative article by John B. Caine, foundry consultant, which was presented as the lead article in the November, 1957 issue. The article pointed out that increased quantities of castings can be sold if their inherent properties are sensibly evaluated and understood.

Now Mr. Caine has prepared a second discussion on this subject, which will be presented in an early issue. The editors believe that this also will be of considerable interest and value to foundrymen.

So I suggest you watch for it.

—o—

Tons?: From a news release on the exhibit of the Big Three automobile manufacturers at the AFS Foundry Show: "Consequently, because every motor vehicle incorporates tons of castings in the finished assembly . . ."

This is a larger market than many of us realized!

—o—

Craftsmanship: The Royal Bank of Canada, Montreal, publishes a monthly letter which covers a wide variety of subjects in an exceptionally able manner. Recently a discussion entitled "Something about Craftsmanship" was so interesting that I would like to present the first few paragraphs:

"The word 'craftsman' may be used of a competent technician or a great artist. It does not apply to any particular sort of occupation, but to the special sort of way in which a man carries out his job, whatever it may be. The good craftsman constructs his product as perfectly as he can.

"Men have done wonderful things with thought and tools, but the inventor, the philosopher, the business executive and the master mechanic need to be first of all at heart craftsmen.

"A man may hide himself from

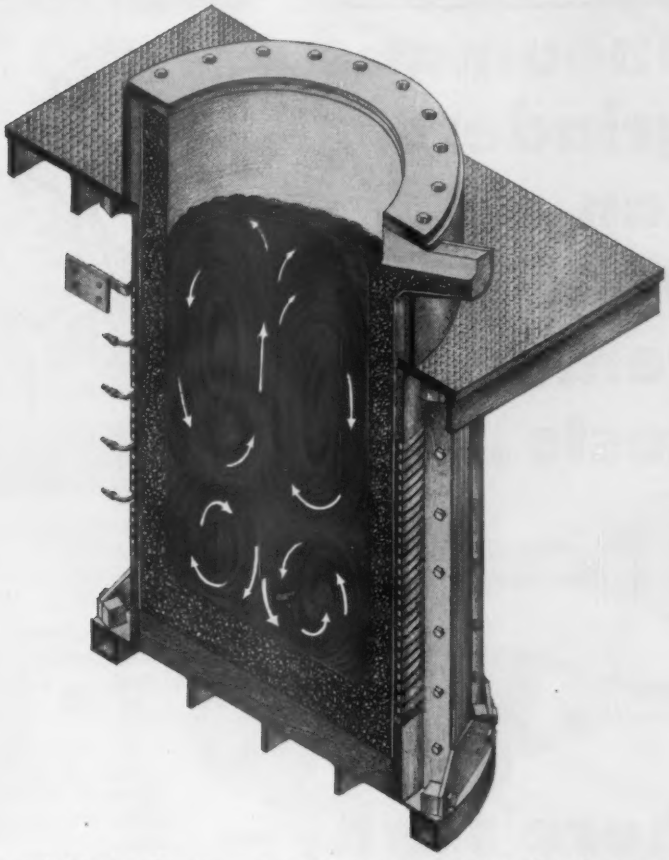
AJAX-JUNKER

a new principle in 60 Cycle induction melting

WHAT IT IS

WHAT IT CAN DO

May We Explore the Possibilities of this New Method with You?



- A cylindrical induction coil supplied with ordinary 60 cycle current induces heat and vigorous electromagnetic stirring in the molten metal charge.

  Integrated electric controls regulate power, maintain high power factor automatically.

  Monolithic refractory linings are made by ramming against the sturdy water-cooled coil held in a rigid frame of magnetic and structural steel.

  This new principle was perfected in Europe over the last seven years. Over 100 Junker furnaces are now in use. AJAX-JUNKER designs are based on latest experience, using American components and practices throughout.

- Outstanding results are proven in these fields:

  DUCTILE and ALLOY IRON CASTINGS
  RECOVERY OF IRON TURNINGS
  RECOVERY OF ALUMINUM SCRAP

  Available sizes range from 1 to 10 tons, with normal melting cycles from 2 to 4 hours. Power ratings are 200 kw through 1500 kw.

AJAX USA

60 CYCLE INDUCTION MELTING

ENGINEERING CORPORATION

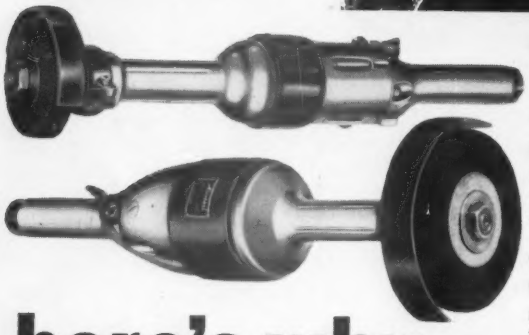
TRENTON 7, NEW JERSEY

Associated Companies: Ajax Electrothermic Corporation Ajax Electric Company

Circle 561 on Page 117

AIRETOOL

pneumatic grinders can cut your metal removal costs . . .



MODEL 600
6" wheel capacity, 6000 to 9000 rpm, length 22", weight 9 lbs.

MODEL 700
8" wheel capacity, 4500 to 6000 rpm, length 22", weight 12 lbs.

Thumb throttle, lever throttle, roll throttle, or grip handle with trigger throttle, optional on both models.

here's why—

POWER Plenty of reserve power to handle toughest snagging jobs . . . no stalling even under severest loads.

SPEED Constant speed is maintained without vibration for faster metal removal . . . longer wheel life.

MANEUVERABILITY Lightweight balanced design makes operation around intricate construction easier . . . less operator fatigue.

LOW OPERATING COST Pneumatic tools are far more economical to operate than any other power equipment.

LONG LIFE Precision construction with hardened steel operating parts assures long maintenance-free service.

VERTICAL GRINDER for fast finishing of flat or curved surfaces. Takes cup wheel, sanding disc or wire brush. Models for 6" abrasive wheel and 7", 8" or 9" disc wheel.

WRITE FOR CATALOG No. 63 on complete line of Airetool Pneumatic Tools and accessories.

AIRETOOL
MANUFACTURING COMPANY
SPRINGFIELD, OHIO

BRANCH OFFICES: New York, Chicago, Philadelphia, Tulsa, Houston, Baton Rouge.

REPRESENTATIVES in principal cities of U.S.A., Canada, Mexico, Puerto Rico, South America, Hawaii, England, Italy, Europe, Japan. CANADIAN PLANT: Brantford, Ontario. EUROPEAN PLANT: Vlaardingen, The Netherlands.

you, or misrepresent himself to you, every other way, but he cannot in his work. His imagination, his perserverance, his impatience, his clumsiness, his cleverness—every thing is there in a man's work. If stonework is well put together, it means that a thoughtful man planned it, and a careful man cut it, and an honest man cemented it.

"Some will say that in this machine age there is less room than formerly for the craftsman's joy in skilled work; but is it true? There is no reason why the machine should not make nice things if it is given half a chance.

"If work were reserved for slaves, we freemen would clamor for a change of government because we were being deprived of the zest of living. Work well done is our contribution to the maintenance of civilization, as well as the means of earning bread. It gives dignity to life, provides satisfactions, offers opportunity for expansion of our ego, and makes rest and leisure meaningful."

—o—

The Line: Congratulations to *The Houghton Line* which celebated its 50th anniversary with the April issue. Back in 1918, Charles E. Carpenter, general manager, E. F. Houghton & Co., Philadelphia, started to write for his own amusement and for the education of the company's distributors and agents. The material caught on, for within a few months approximately 5000 requests were received to be put on the mailing list. Today the circulation is 200,000.

When Mr. Carpenter died in 1929, the *Line* was temporarily suspended, and a technical publication, *Black and White*, was substituted. Readers did not like it, so the *Line* was reinstated with a newspaper columnist doing the writing. This did not prove satisfactory either, and so Aaron E. Carpenter, son of the original editor, took up the editorial task, and has carried on most successfully since under the title of "Near Editor." Mr. Carpenter now is chairman of the board.

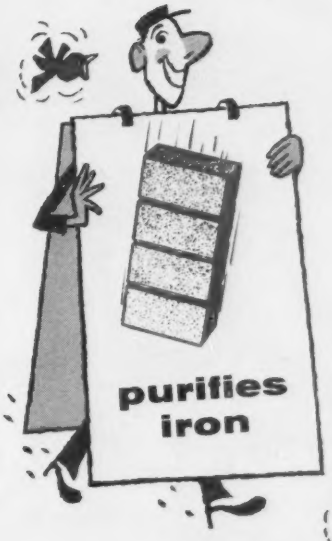
—o—

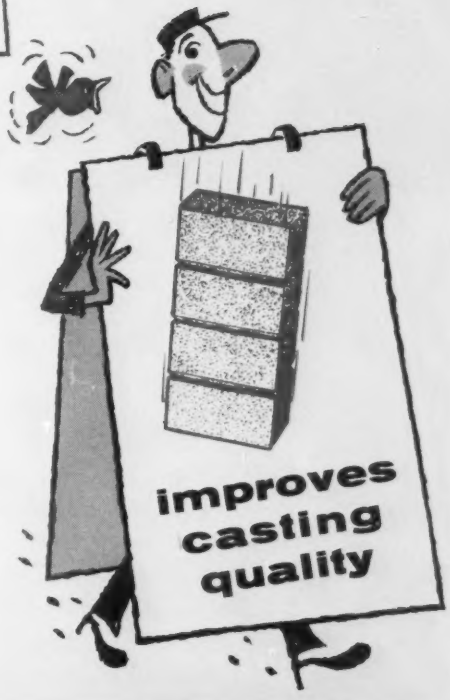
Are You? The editors feel grateful that superlatives have been used by a few of our readers to describe the feature presented in the May issue entitled "Are You Paying for Equipment That You Don't Have?" They indicate that all foundry management as well as equipment manufacturers and salesmen should really study that presentation.

Single copies of the 25-page article are available on request. F.G.S.

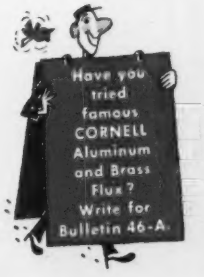
Circle 562 on Page 117

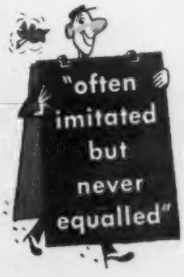
F L U X





Wherever you go, foundrymen will recommend Famous Cornell Cupola FLUX. That's because this is the one flux that brings results day after day. The reason? Famous Cornell Cupola FLUX is a scientifically prepared mixture of high grade minerals and other materials which create a chemical reaction in molten iron by greatly increasing slag flow off. Iron is always cleaner. Write for Bulletin 46-B.





The CLEVELAND FLUX Company

1026-40 MAIN AVENUE, N. W. • CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918

FAMOUS CORNELL FLUXES

Trade Mark Registered

Circle 563 on Page 117

THE NEW HERMAN
Moldmaster
Another revolutionary machine developed to meet
the normal molding requirements of most foundries.

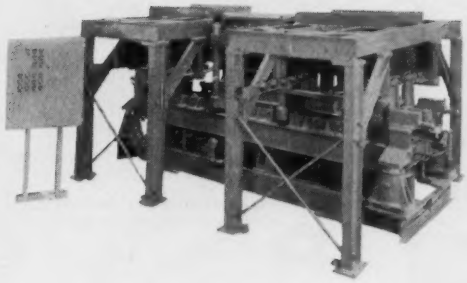
The flexibility of the jolt, squeeze, strip machine, makes it readily adaptable to a wide variety of molding applications, as illustrated.

The Herman Moldmaster fits into four different methods of operation. It is designed to operate by automatic, semi-automatic or push-button controls.

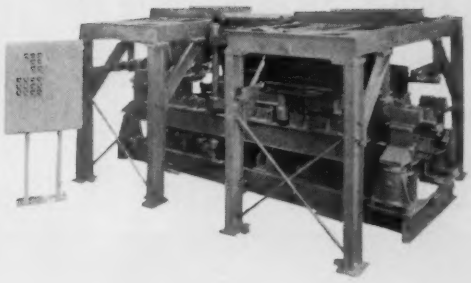
The Moldmaster has the exclusive Herman feature of self-adjusting squeeze head attached to the jolt machine. This contours the squeeze head for any shape of pattern. Jolt squeeze action is simultaneous.

Sand flows in such a manner as to insure a perfect mold. Wear on the Moldmaster as well as the pattern equipment, is practically eliminated. Mold hardness can be increased or decreased at any point.

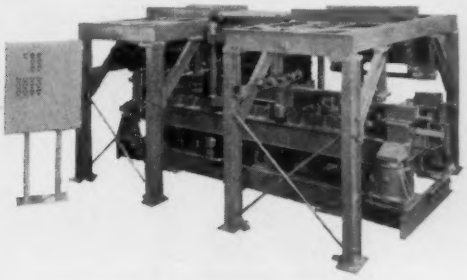
For more detail on the many outstanding features of this machine, ask for our Technical Bulletin No. JSS-5-58.



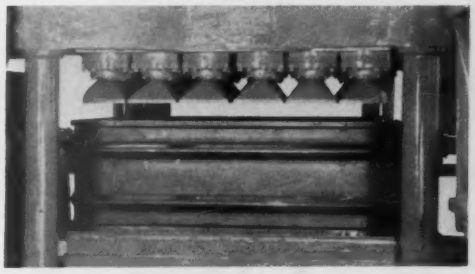
1 The mold has been simultaneously jolt squeezed, rammed, and returned to the stripper station. The mold has been stripped and is in position to be discharged.



2 The mold has been discharged and the incoming empty flask has automatically been positioned and lowered onto the pattern to be moved to the ramming station.



3 The empty flask which had been placed on the pattern is now in position at the jolt squeeze station. The flask had been filled automatically and struck off while moving from the stripper station.



4 The mold has been simultaneously jolted and squeezed. Self-adjusting squeeze heads have been retracted and the mold is ready to be moved to the stripper station.

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

HERMAN

Best Known Name in Molding Machines

Circle 564 on Page 117

WHY PAY MORE

when you can buy the best binder at the lowest price!

INSIST ON STEINEX

the original CO_2 Binder available

only **from Carver**

BEST QUALITY Steinex gives you absolutely the best shakeout — BY FAR!

BEST PRICE Steinex is 30% lower in cost than any other binder on the market!

BEST SERVICE Carver has the in-the-foundry experience and know-how to help you use Steinex in your CO_2 operation — successfully and profitably!

JOIN THE HUNDREDS OF FOUNDRIES THAT INSIST ON THE BEST

MAIL TODAY

CARVER FOUNDRY PRODUCTS CO.
Muscatine, Iowa

RUSH information and prices on Steinex binders.

NAME _____ TITLE _____

FOUNDRY _____

CITY _____ STATE _____

Calendar of MEETINGS

June 5-7—Material Handling Equipment Distributors Association, annual convention, LaSalle Hotel, Chicago.

June 9-10—Malleable Founders' Society, annual meeting, Homestead, Hot Springs, Va.

June 9-12—National Materials Handling Exposition, Public Auditorium, Cleveland.

June 12-13 — American Foundrymen's Society, annual chapter officers conference, Hotel Sherman, Chicago.

June 19-21—American Foundrymen's Society, foundry instructors seminar, Case Institute of Technology, Cleveland.

June 22-27—American Society for Testing Materials, annual meeting, Statler Hilton and Sheraton-Plaza Hotels, Boston, Mass.

June 23-25 — Investment Casting Institute, spring meeting, Occidental Hotel, Muskegon, Mich.

Sept. 10-11—American Die Casting Institute, annual meeting, Edgewater Beach Hotel, Chicago.

Sept. 15-19—Instrument Society of America, annual instrument - automation conference and exhibit, Convention Hall, Philadelphia.

Sept. 22-23—Steel Founders' Society of America, fall meeting, Homestead, Hot Springs, Va.

Sept. 22-24—Material Handling Institute Inc., joint industry fall meeting, Greenbrier, White Sulphur Springs, W. Va.

Sept. 23-26—Association of Iron & Steel Engineers, 1958 Exposition and convention, Public Auditorium, Cleveland.

Oct. 8-10—Gray Iron Founders' Society, annual meeting, Sheraton Park Hotel, Washington.

Oct. 13-15—American Gas Association, annual convention, Convention Hall, Atlantic City, N. J.

Oct. 15-16—Michigan Regional Foundry Conference, University of Michigan, Ann Arbor, Mich.

Oct. 16-17—All-Canadian Foundry Conference, Royal Connaught Hotel, Hamilton, Ont.

Oct. 16-18—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 17-18—New England Regional Foundry Conference, Massachusetts Institute of Technology, Cambridge, Mass.

Oct. 18-21—Conveyor Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 27-30—Metallurgical Society of AIME, fall meeting, Cleveland.

Oct. 27-31—American Society for Metals, national metals exposition and congress, Public Auditorium, Cleveland.

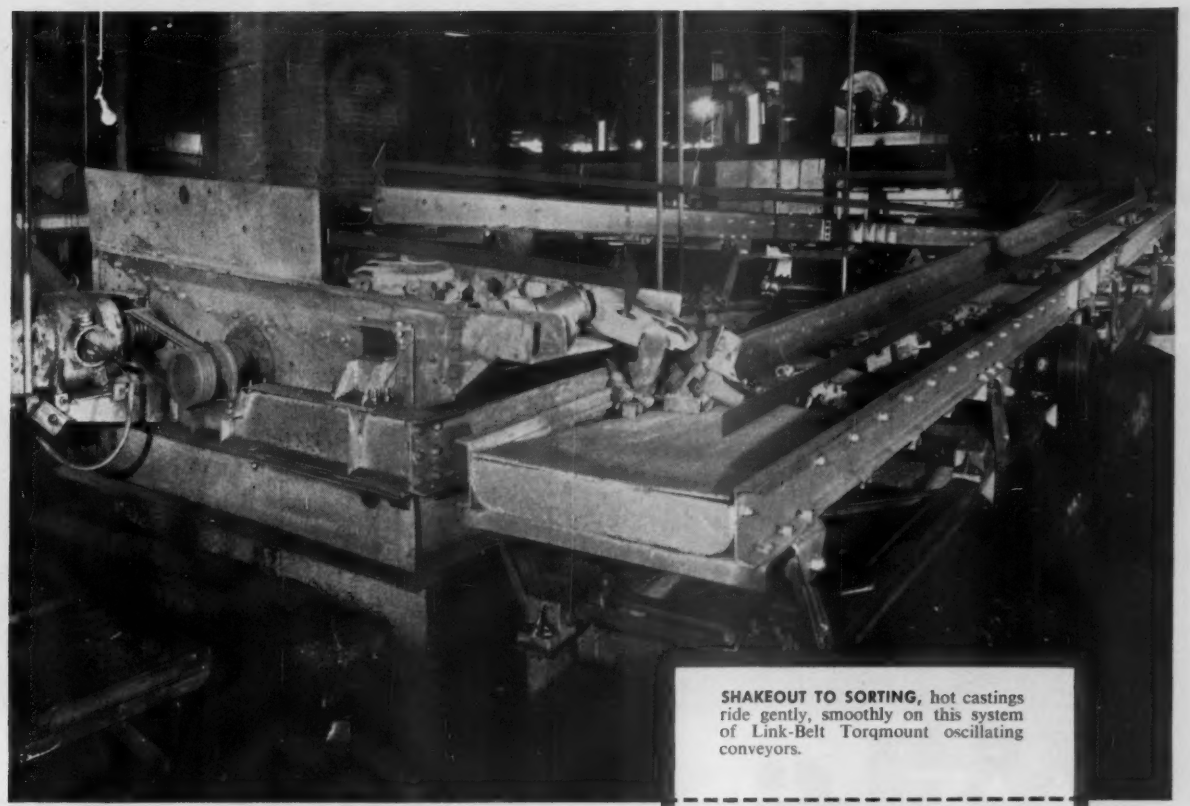
Oct. 30-31—Metals Casting Conference, Purdue University, Lafayette, Ind.

Oct. 31-Nov. 1—Northwest Regional Foundry Conference, Multnomah Hotel, Portland, Oreg.

Nov. 10-12—Steel Founders' Society of America, technical and operating conference, Carter Hotel, Cleveland.

Nov. 20-21—National Foundry Association, annual meeting, Drake Hotel, Chicago.

Dec. 3-5—American Institute of Mining, Metallurgical, & Petroleum Engineers, Electric Furnace Steel Conference, Detroit.

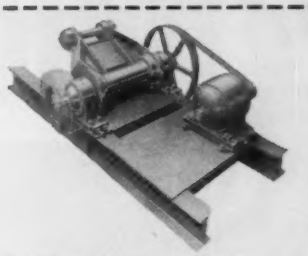


SHAKEOUT TO SORTING, hot castings ride gently, smoothly on this system of Link-Belt Torqmount oscillating conveyors.

Here's a conveyor that handles castings with

less wear-less care

Both operating and maintenance costs are low with Link-Belt Torqmount oscillating conveyors



FULL-TIME POSITIVE-ACTION, constant-stroke eccentric drive of Link-Belt Torqmount oscillating conveyors supplements natural frequency . . . provides a powerful yet gentle upward and forward oscillating motion. Large volumes of material are moved in a uniform, continuous flow, regardless of surges.

BEFORE installation of Link-Belt Torqmount oscillating conveyors, handling hot castings was a continual source of trouble at Benton Harbor Malleable Co., Benton Harbor, Michigan. Equipment originally used was often in need of repair, causing excessive waste of time and manpower. Torqmounts ended this problem. After long, rugged service they show virtually no wear . . . have required little maintenance.

Long, trouble-free performance is but one of many benefits provided by Torqmounts. Their *full-time positive action* refuses to dampen under heavy surge loading conditions . . . material is conveyed uniformly. Power requirements and maintenance are minimized with Link-Belt's unique torsion bar-spring action. And their compactness permits exceptional installation flexibility.

For full details on oscillating conveyors and other Link-Belt foundry equipment, contact your nearest Link-Belt office. Or write for Books 2444 and 2423.

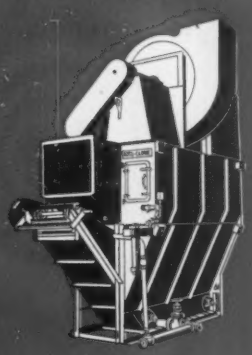
LINK-BELT

OSCILLATING CONVEYORS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 14,862

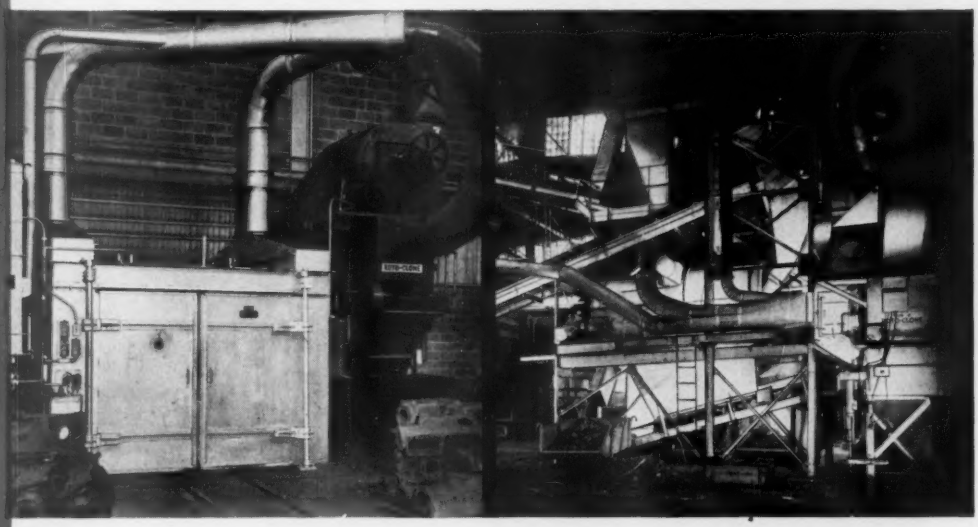
Better Air Is Our Business

Type N ROTO-CLONE



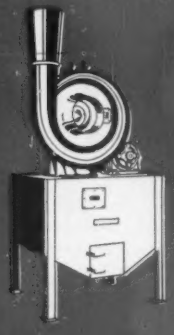
ABRASIVE CLEANING, SAND HANDLING

The Type N ROTO-CLONE is widely used for exhausting both abrasive cleaning (below left) and sand handling operations. High cleaning efficiency of this hydrostatic precipitator results from the combined action of centrifugal force and the thorough intermixing of water and dust-laden air. Automatic sludge ejector provides for easy disposal of collected material. Bulletin 272.



AAF fights foundry

GRINDING

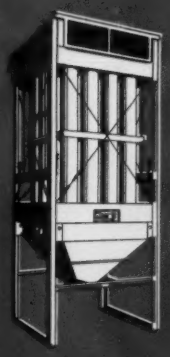


Type D ROTO-CLONE

The usual recommendation for snag, portable and swing frame grinding dust is the Type D ROTO-CLONE which combines exhauster and separator in a compact, self-contained unit. It draws in the dust-laden air, delivers the collected material to the storage hopper and expels the cleaned air —all in a single operation with only one moving part: the impeller. Bulletin 272.

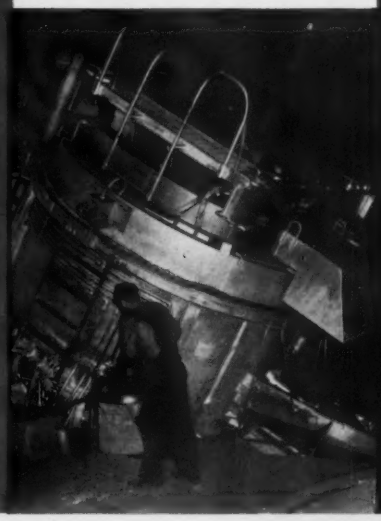
High efficiency, low cost and small space requirements make AAF's Type W ROTO-CLONE a favorite for shakeout operations. Water sprays extend the effectiveness of the dynamic forces to the collection of the lightest and finest dust particles. Requires little maintenance, uses a minimum of water and maintains efficiency regardless of variation in air volume. Bulletin 274.

AMERjet



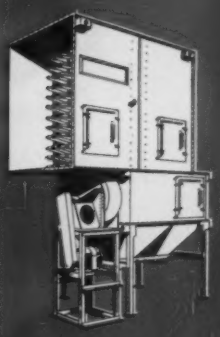
The AMERjet Fabric Dust Arrester is recommended for metallic fumes from electric melting furnaces. Reverse jet principle allows velocities through the cleaning media up to 5 times greater than ordinary fabric collectors. Constant air volume is assured by constant, automatic and continuous reconditioning of cleaning tubes. Bulletin 279.

ELECTRIC MELTING FURNACE



AAF's AMERclone dry centrifugal, originally designed for boiler fly ash, is the answer to cupola stack gases. Not a cinder-catcher, the AMERclone traps the fine particles that often settle on parking lots and surrounding neighborhoods. One AMERclone handles two cupolas alternately, assuring full-time utilization of equipment. Bulletin 291.

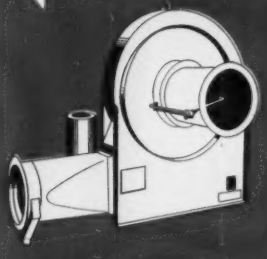
AMERclone



CUPOLA

dust on all fronts

SHAKEOUTS



Type W ROTO-CLONE

Where is process dust causing you trouble?

GRINDING? SHAKEOUTS?
ABRASIVE CLEANING? CUPOLAS?
SAND HANDLING? MELTING FURNACE?

Only a complete line of versatile dust control equipment can successfully fight the plant-wide battle against foundry dust. And the world's most complete line is AAF. It includes hydrostatic precipitators, dynamic precipitators, dry centrifugals and fabric arresters.

AAF's 20 years experience in foundry dust control assures the right unit for every dust-producing operation, regardless of type of dust or concentration. Every product in the line, what's more, offers the basic design features you expect from AAF:

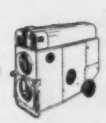
- **Small space requirements**
- **Maintained performance over a wide range of operating conditions**
- **Constant exhaust volumes**
- **High collection efficiency**

Here they are—AAF's "stable of champions" for foundry dust control. One of them will answer *your* dust problem. For more information on any or all, call your local AAF representative or write direct.

AAF herman nelson

American Air Filter — BETTER AIR IS OUR BUSINESS

COMPANY, INC.
266 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.



Herman Nelson Portable Heaters

Illinois Steam Heating Specialties

AAF Electric Furnace Hoods

AAF Type K Exhauster

Circle 567 on Page 117

Hats Off to SMITH L-O CORE OIL

Foundrymen everywhere "doff their hats" to Smith L-O because here is a core oil that means *smooth going!* And that is a statement of fact. Smooth going with Smith L-O comes from the *controlled uniformity* of the grade core oil that is best suited to your operation. And that grade you require means a lot, too, and its use is based on the recommendation of the qualified Smith Practical Foundry Serviceman in your area. Call him in when you want assistance . . . it is his business to study your requirements and it's a habit of his to come up with the right recommendation. Yes . . . hat's off to Smith L-O —the name that stands for a service as well as a product.

SMITH REPRESENTATIVES

- ALGONQUIN CHEMICAL CO., INC. Hamburg, Pennsylvania
- FOUNDRIES MATERIALS CO. Coldwater, Michigan
- FOUNDRY SERVICE CO. Birmingham, Alabama
- F. F. SHORTSLEEVE Elmira, New York
- PACIFIC GRAPHITE CO., INC. Los Angeles 22, California
- ST. LOUIS COKE & FOUNDRY SUPPLY CO. St. Louis, Missouri
- BRUCE-CONREAUX CO. INC. Indianapolis 7, Indiana
- WESTERN INDUSTRIAL SUPPLY CO. Portland 14, Oregon
- MALCOLM G. STEVENS Arlington, Massachusetts
- OVERSEAS COMMODITIES, LTD. Vancouver, B.C., Canada

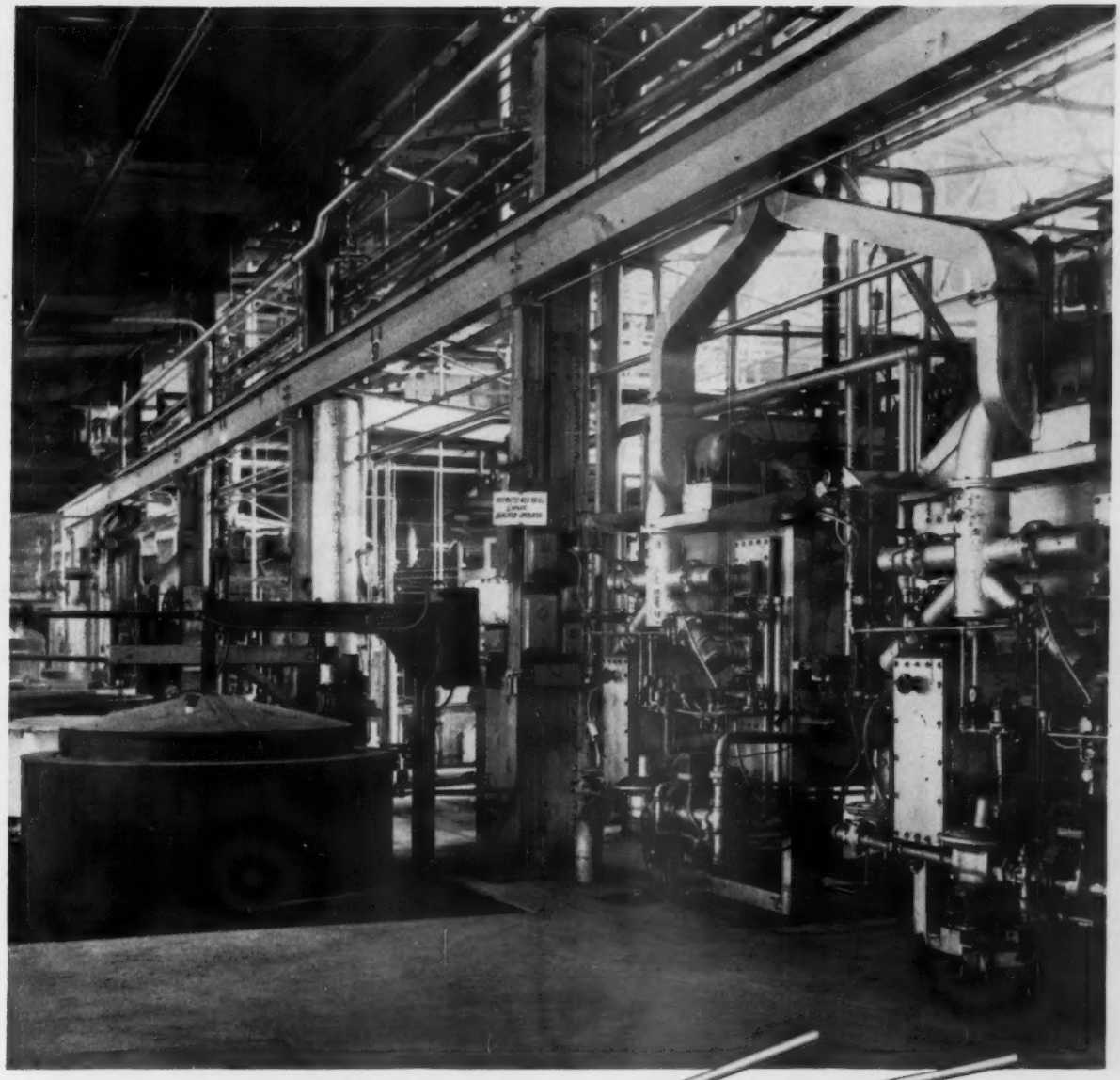
Smith L-O Core Oil

ROD DIP LIQUID PARTING

SMITH OIL & REFINING CO.

INDUSTRIAL OILS DIVISION • ROCKFORD, ILLINOIS

Circle 568 on Page 117



now! P&H

HEAT-TREATABLE electrodes

. . . to match exactly the heat-treating properties and chemical analysis of your high carbon and alloy castings — .25 carbon, .40 carbon, the full range of chrome-moly, and such alloys as 4130, 4140 and 4340.

Write now for your copy of Bulletin R-48 "P&H Heat-Treatable Electrodes," just off the press, showing analysis charts and full description of this first full range series. Send request to Dept. 329N, Harnischfeger Corp., Milwaukee 46, Wis.

HARNISCHFEGER

P&H WELDERS • ELECTRODES • POSITIONERS

MILWAUKEE 46, WISCONSIN

Circle 569 on Page 117

HINES

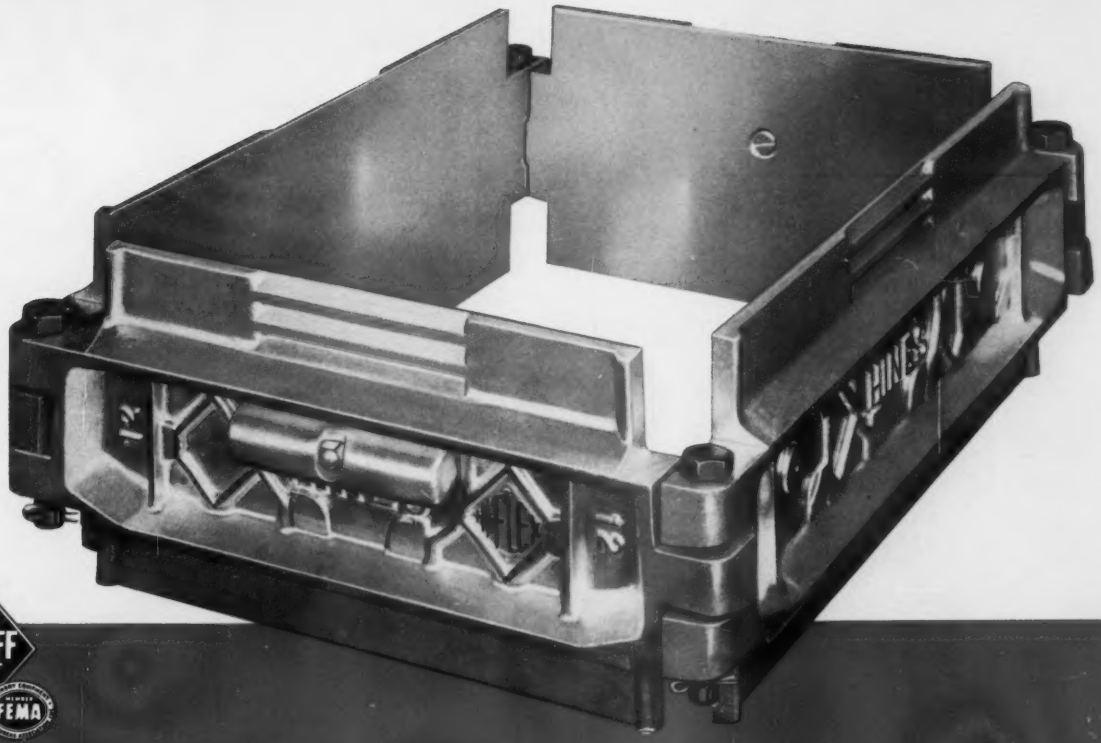
HI-FLEX*

CAST JACKETS

another
new HINES advancement in molding equipment for better, more economical foundry production

*TRADE MARK

Circle 570 on Page 117



HINES POP-OFF FLASK

MEMBER FEMA

Now, from HINES, comes a *truly flexible*, cast jacket — the HI-FLEX*.

This remarkable new jacket, upon application to the mold, instantly and accurately assumes the exact shape of the mold and automatically adjusts itself to the mold taper.

In addition, the fit on the mold, in relationship to the parting line, can easily be changed by replacing the corner pins with pins of larger or smaller diameter. This feature also permits adjusting the HI-FLEX* jacket to fit either slip or POP-OFF molds.

HI-FLEX* jackets are cast of aluminum and iron, in all sizes. They are jig and fixture built to insure maximum accuracy (as are all HINES flasks and jackets). End and side castings may be purchased separately and corner pins are available in a variety of diameters, for changing the fit on the mold. Additional optional equipment — filleted corner inserts and steel corner protection shields.

The HINES FLASK *Co.*

3431 WEST 140th STREET • CLEVELAND 11, OHIO

From shakeout to shipping

handling is easier with **Jeffrey MV**

Vibrating Conveyors...

Protected against foundry dust and dirt; built rugged to stand heavy service and take materials as they come—that's why foundries go for Jeffrey MV conveyors.

You don't have to "baby" these units. They handle hot sand, hot castings and poured molds in stride, move them gently and with ease—keeping breakage at a minimum. Compared with other metallic-type conveyors, Jeffrey MV's cost less to install. And, because of their low power consumption and maintenance needs, they cost less to use.

Jeffrey MV conveyors are versatile and compact—come as complete packages in widths and lengths to suit a broad variety of foundry and other plant jobs. Connect them to power and they're set to go to work.

Catalog 859 describes MV conveyors and the various types of decks available for foundry service. Write: Foundry Engineering Division, The Jeffrey Manufacturing Company, 907 North Fourth Street, Columbus 16, Ohio.

JEFFREY

Conveying • Processing
Mining Equipment...
Transmission Machinery...
Contract Manufacturing

HOW TO

AVOID CASTING FINS IN SHELL MOLDING

Fins are for fish, not for castings. Here are five suggestions that will help you avoid them.

1. Improve bonding practice. Position second mold half before bonding adhesive begins to cure. If shell is too hot, lower pattern temperature or allow shell to cool before applying bonding resin.

2. Clean mold surfaces before assembly. Loose sand or other foreign materials won't let shell halves press firmly together.

3. Clean pattern; avoid lubricant buildup. Any buildup on the pattern creates a cavity with respect to the mold. Likewise, pattern depressions create high spots that prevent flat mating of mold halves.

4. Check for warped shells. These seldom fit together perfectly even when bonded.

5. Resin should be fully cured. For a perfectly flat shell there must be no rubberiness at ejection. Otherwise, shell mating must be accomplished quickly.

Another helpful hint for better shell molding: use G-E shell resins. You can depend on them—and on the practical experience of G.E.'s technical service specialists. Some of this experience has been summarized in a brochure, "59 Answers to Your Shell Molding Problems." For your copy write General Electric Company, Section F28, Chemical Materials Dept., Pittsfield, Mass.

Progress In Phenolics

GENERAL ELECTRIC

Circle 572 on Page 117

Protection from Metal Splashes

Here it is...

AO's New 315 NFA Foundry Goggle

(Also available in Dust goggle as No. 316 with 150 mesh inner screen set behind a 16 mesh screen)

Engineered Vision and Protection at their best for Foundrymen and Others!

This goggle (like its predecessor which American Optical developed for the NFA) is recommended for protection against impact hazards such as chipping, melting, pouring, grinding, babbitting, riveting, hand tool and machine work. Goggle is regularly supplied with soft *plastic* mask — with leather available. Edges of sponge rubber are bound with corduroy. Super Armorplate clear or Calobar lenses in medium, dark or extra dark shades.

FEATURES...

1. Greater Protection — larger face mask
2. Better Vision — 57.8 mm. wide vision lenses instead of the former 50 mm. round lenses
3. Increased (double) Ventilation — 40 mesh screen
4. Perfect Fit — Over all types of spectacle glasses. One-piece, easily adjustable rubber headband "clips" through metal frame instead of mask — assures maintained closer fitting
5. Standard screw endpieces

Quality costs no more! Always insist on the AO Trademark. Your nearest American Optical Safety Products Representative can supply you.

American Optical
COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS
Branches in Principal Cities

(PATENT APPLIED FOR)

NEW MANHATTAN SAFETY BACK FLARED CUP

Not simply a new safety "feature" . . . not merely a design "improvement." Here's a *totally new concept* of flared cup wheel design *and* construction . . . developed by Manhattan engineers to give the greatest safety and performance advantages possible for flared cup wheel users. Manhattan's revolutionary SAFETY BACK Flared Cup puts portable wheel *safety* where it counts the most—in *original* strength and breakage resistance!

SAFETY BACK far surpasses ordinary safety features such as anchor bushings, safety rings, special hub mountings, or revolving cup guards. With SAFETY BACK, steel covers the *entire* back of the flared cup . . . extends down the side to offer a degree of reinforcement and breakage resistance never before possible!

NO OTHER WHEEL—AT ANY PRICE—OFFERS THESE EXCLUSIVE FEATURES

- **Greatest Initial Strength**
- **Highest Safety Factor**
- **Easy Mounting—Easy Operation**
- **Improved Mounting Base**
- **One Piece Assembly**
- **Requires No Adjustment**

Only SAFETY BACK gives you these features—*plus* Manhattan's custom-engineered abrasive bond for *faster* removal of *more* metal on your particular job—at no additional cost! For "More Use per Dollar" in portable grinding operations, you can't get a faster cutting, longer lasting—*safer* wheel than MANHATTAN.

Let a Manhattan abrasive wheel engineer show you the advantages of SAFETY BACK Flared Cups, and other types of Manhattan high speed, heavy duty abrasive wheels. Write for Bulletin 7157.

BB-792R1

GRINDING WHEEL INSTITUTE MEMBER

WRITE TO THE ABRASIVE WHEEL DEPARTMENT

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Belts • Hose • Roll Covering • Tank Linings • Industrial Rubber Specialties • Abrasive and Diamond Wheels • Brake Blocks and Linings • Clutch Facings • Asbestos Textiles • Mechanical Packings • Engineered Plastics • Sintered Metal Products • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls

Circle 574 on Page 117

BAD BREAKDOWN becomes Lucky Break for STUDEBAKER

How auto manufacturer's 13th Simpson Mix-Muller turned trouble into tonnage on manifold line

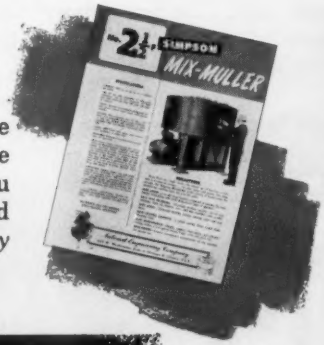
It was December 10, 1956. Studebaker-Packard Corporation was in full swing on their new models—when "old faithful" gave up the ghost. A 10-year old mixer used to prepare all molding sand on the manifold line had suffered a major breakdown. All of their other mixers were *Simpsons*—no chance of switching parts. Things were bad—30 days wait for repairs and the whole slinger line was down.

The fit was tight—3/8" clearance at one point; and delivery was a problem. But, *one week later* Studebaker Foundry took delivery on a new 2½F Simpson Mix-Muller.

Shortly thereafter the new Simpson was turning out *twice* the amount of sand per hour, per batch and per day. The slinger line was back in operation with more and *better* sand . . . to produce quality parts consistent with the Studebaker-Packard reputation.

What seemed to be a bad breakdown turned into a *lucky break* for Studebaker. Here's what else they got with the 2½F Simpson Mix-Muller that they didn't expect to buy:

- **Two times more sand with an $800 per year savings in horsepower (60 HP now—100 HP previous).**
- **Big batch capacity at slower speed meant that no special cooling devices were needed.**
- **Hot sand and loss of fines through cooling was eliminated.**
- **No major repairs to date and excellent plow life is reported.**
- **Lower sea coal costs.**
- **More positive moisture control.**

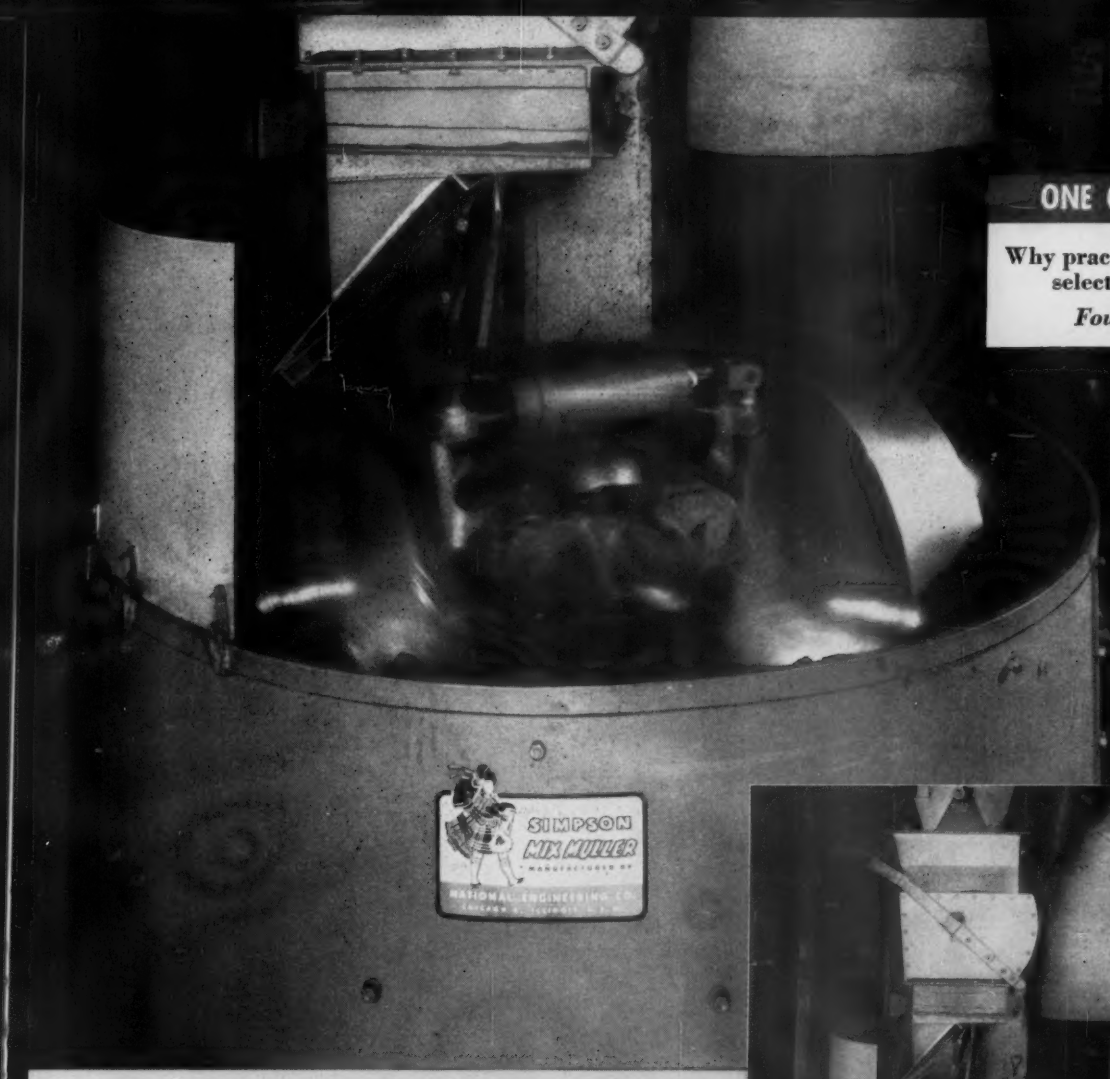


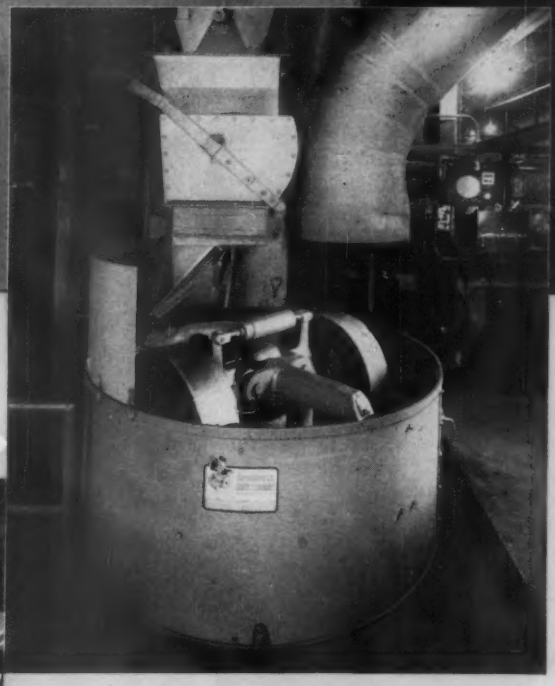
Why wait for YOUR next mixer breakdown? . . . to weigh the value of more and better sand against the doubtful economy of expensive and often hard-to-get, repairs. Let your NATIONAL agent show you modern mulling, in action . . . There's a Simpson Mix-Muller equipped shop near you and there's a Simpson Mix-Muller for your *every* foundry requirement.

Write for Specification Sheet on the 2½F Mix-Muller

ONE OF A SERIES:

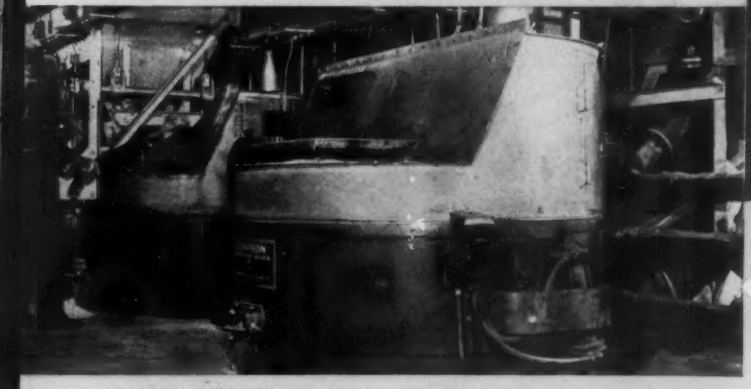
Why practical foundrymen select Simpson by *Four to One*





2½F SIMPSON MIX-MULLER handles all molding sand requirements for Studebaker's manifold line at South Bend, Ind. foundry. Unit has: increased sand output, eliminated hot sand, slashed HP requirements and improved sand quality.

PHOTOS SHOW Mix-Muller shortly after installation. Temporary dust shield and undersize hopper will be replaced with dust tight hood, enclosing new full size National batch hoppers. Duct at right formerly exhausted hot air, condensates (and fines) to roof. Cooling is no longer necessary with the new Mix-Muller.



12 OTHER MIX-MULLERS serve Studebaker Foundry in all of their foundry operations.

NATIONAL ENGINEERING COMPANY

ANOTHER! PROVEN PRODUCT OF THE PRACTICAL FOUNDRYMAN BY **NATIONAL**

646 Machinery Hall Bldg. • Chicago 6, Illinois

Circle 575 on Page 117

F-258

Hit a new low in snagging costs

Norton abrasive-and-bond team hits a new high in "Touch of Gold" economy—on any grinder

On Your Swing Frame Grinders 44 ALUNDUM B11 wheels stand up under heavy pressures, combining fast cutting action with extra long wheel life on steel and annealed malleable iron castings.

Although 44 ALUNDUM abrasive is non premium-priced, it is entirely different from any other ordinary aluminum oxide abrasive—and better in every way. In fact, it's a real workhorse abrasive that delivers thoroughbred performance — with faster, freer cutting action that means easier handling, and extra toughness that means greater economy.

In the B11 bond, you have another typical example of how Norton is constantly advancing grinding wheel manufacture and performance. Here's a new resinoid bond that gives wheels more uniform structure and better balance — plusses that pay off on every snagging job. And the B11 bond provides half-grade increments throughout the entire hardness scale — enabling you to choose exactly the right wheel for every job.

Those are major reasons why 44 ALUNDUM B11 wheels cut snagging costs — in terms of tons ground, pounds of metal removed per wheel, or man-hours per ton ground.

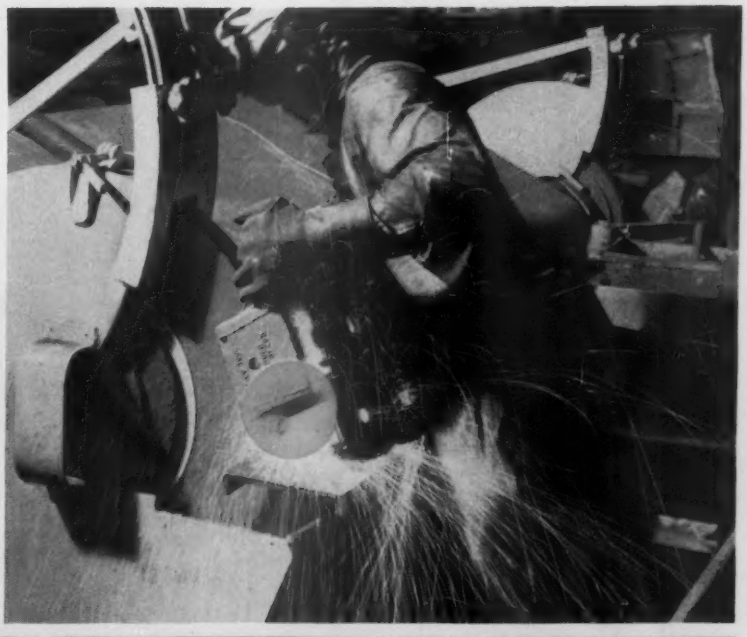
And here are typical reports, from steel foundries throughout the country, handling the widest range of snagging jobs, describing the performance results of Norton 44-B11's *vs.* competitive wheels, tested on the same grinders:

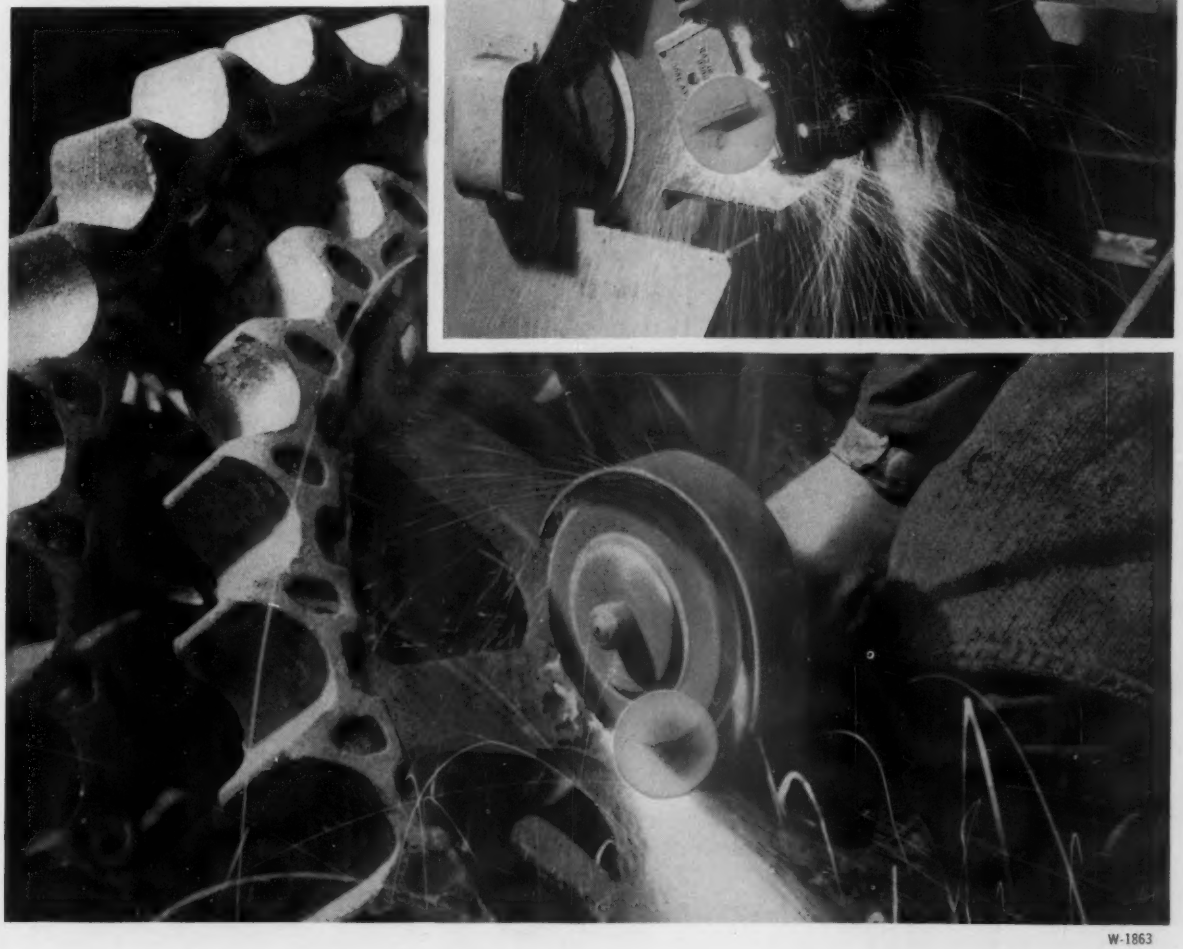
- *Among 79 competitive wheels of 5 different makes, the average cost per ton of malleable steel ground was $2.23. Norton 44-B11's averaged $1.50 per ton per wheel.*
- *Snagging stainless steel castings, 44-B11's lasted several times as long as competitive wheels, with superior cutting action.*
- *Offhand snagging with competitive wheels resulted in 800 steel brake shoe castings per wheel. Norton 44-B11's upped this to 1000 per wheel, with faster cutting action.*
- *In general purpose snagging, competitive wheels on portable grinders lasted 8 hours. Doing the same jobs, 44-B11's lengthened wheel life to 10 hours.*
- *On swing frame grinders, 44-B11's gave over 140 hours of wheel life, against competitive wheels' best of 96 hours.*

-with 44 ALUNDUM* B11 wheels

On Your Floor Stands you get maximum efficiency — and economy — by using 44 ALUNDUM B11 wheels on both spindles when you are snagging steel or annealed malleable iron castings.

On Your Portable Grinders the smaller 44 ALUNDUM B11 wheels — straight wheels, cups, cones or any other shapes — do the same big job of cost cutting.





W-1863

• *In many snagging tests, 44-B11 cone and plug wheels, on portable grinders, lasted much longer and performed much better than wheels of all other makes.*

Substantial reorders of Norton 44-B11 wheels followed these and many other comparative tests. Your Norton Distributor will be glad to arrange similar test runs in your own foundry. Why not let him prove to you how this Norton-engineered "Touch of Gold" can save you time and money. NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

NORTON
ABRASIVES

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

Making better products . . . to make your products better

NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — BEHR-MANNING DIVISION Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

Circle 576 on Page 117

Digs More . . 4,500 lbs. breakout force

Carries More . . 2,500 lbs. carry capacity

Delivers More . . with power-shift

. . than ever before!

All-New H-25 PAYLOADER®

Ask about . . .

PURCHASE AND
HOUGH
LEASE PLANS

Now your Hough Distributor has at his disposal the broadest and most complete set of financing plans ever offered: — TIME PAYMENT . . . LEASING PLANS, with or without OPTION TO PURCHASE — any and all kinds of financing to best fit your needs.

THE FRANK G. HOUGH CO.
703 Sunnyside Ave., Libertyville, Ill.

Send complete data on the outstanding new model H-25 "PAYLOADER".

Name _____

Title _____

Company _____

Street _____

City _____

State _____

6-A-1L

The most important fact about this outstanding new machine is that it will handle more material per hour and at less cost per ton than any front-end loader anywhere near its size.

It has a carry capacity of 2,500 lbs. with a wide range of operating speeds, yet it goes in and out of boxcars with 6-ft. doors to load or unload them.

The two-speed full-reversing power-shift transmission with torque converter and its power steering are big reasons why it can produce all-out all day without operator fatigue.

There are many other features that put the H-25 in a class by itself . . . in productivity, ease of operation and low maintenance. A variety of attachments, quickly interchangeable with the bucket, are also available to handle many other materials besides bulk loads.

Your Hough Distributor is ready to show you that the H-25 can dig more, carry more and deliver more bulk than you ever saw this size of machine handle before.

SAY "HUFF"

Modern Materials Handling Equipment
THE FRANK G. HOUGH CO.
LIBERTYVILLE, ILLINOIS
SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY

Late News

NFFS ELECTS: Phillip E. Lankford is the new president of the Non-Ferrous Founders' Society. A partner in East Birmingham Bronze Co., Birmingham, he was named at the society's recent annual meeting in Cleveland to succeed Charles J. Egetter, Crown Brass Mfg. Co., Alhambra, Calif. M. E. Nevins, Wisconsin Centrifugal Foundry Co., Waukesha, Wis., was elected first vice president and Elmer G. Brumund Jr., Brumund Foundry Inc., Chicago, second vice president.

APPRENTICE WINNERS: Five first-place winners announced last week in the Robert E. Kennedy Memorial Apprentice Contest of AFS represent widely scattered sections of the country. Top apprentices are William Boatright, Airesearch Mfg. Co., Los Angeles, nonferrous molding; Robert McDermott, Brown & Sharpe Mfg. Co., Providence, R. I., gray iron molding; James E. Gift Jr., Dodge Steel Co., Philadelphia, steel molding; Paul Niebur, Central Pattern Co., St. Louis, metal patternmaking; Adam J. Kravetz, Progress Pattern Co., Pontiac, Mich., wood patternmaking.

OBITUARY: Alex W. Pirrie, American Standard Products (Canada) Ltd., Toronto, Ont., a national director of the AFS, died May 22 while attending the AFS Congress in Cleveland . . . Daniel E. MacLean, 63, vice president, Lava Crucible-Refractories Co., Pittsburgh, died April 26 . . . Alfred H. Noyes, 79, chairman and former president of Hills-McCanna Co., Chicago, died April 24 in Florence, Italy.

NEW FOUNDRY: Climax Foundry Co., 3400 Brighton Rd., Denver, has been formed to produce gray iron castings. Pearson M. Payne is president, Ernest Tomeo vice president, and C. C. Drake secretary-treasurer.

ALUMINUM USE: Aluminum Association reports that civilian motor vehicles accounted for 70 per cent of aluminum permanent mold castings consumed last year. Home appliances took 10 per cent. Motor vehicles used 15 per cent of all aluminum sand castings; industrial and commercial machines, equipment, and tools took 35 per cent, and national defense accounted for 23 per cent.

SHOW CAR WINNERS: Bryan MacPherson, Birmingham; Stanley Subko, Chicago, and J. M. Kelly, Trafford, Pa., were the first three names drawn as prospective winners of the three automobiles given away at the AFS Foundry Show in Cleveland. Awarding of the cars awaits confirmation of the winners' eligibility as society members. A list of 17 additional names was drawn to provide alternate winners in the event of ineligibility of any of the first three individuals. Registration at the Congress and Show was reported by AFS to have totaled about 12,000.

DIRECTORS: Malleable Founders' Society has elected the following to four-year terms as directors: Joseph Abusamra, president, Belcher Malleable Iron Co., Easton, Mass.; Robert S. Bradshaw Jr., president, Texas Foundries Inc., Lufkin, Tex., and Thomas T. Lloyd, vice president, Albion Malleable Iron Co., Albion, Mich.

CONSTRUCTION UP: Despite a 17 per cent drop from the level a year ago in industrial construction expenditures during the first quarter, total expenditures showed a 1 per cent gain. Offsetting factors were increases in spending for highways, utilities, institutions, homes, and farms.

PERSONALS: Emil J. Romans has been named foundry superintendent, National Malleable & Steel Castings Co., Cleveland, succeeding Frank M. Steigerwald, retired . . . A. J. Rumely Jr. has succeeded his father, A. J. Rumely Sr., as president and treasurer, LaPorte Foundry Co., LaPorte, Ind. Paul Menkhaus becomes vice president and general manager, and Frank O. Borg succeeds him as foundry superintendent . . . M. J. Henley, recently senior

vice president, Tyler Pipe & Foundry Co., Tyler, Tex., has been made vice president and general manager . . . Carl Rowe has been made president, Milwaukee Valve Co., Milwaukee. He had been vice president and general manager . . . Harvey R. Hiller has been appointed assistant district sales manager of Harbison-Walker Refractories Co.'s Chicago district.

AFS OFFICERS: Lewis H. Durdin, president, Dixie Bronze Co., Birmingham, was elected president of the American Foundrymen's Society at the Cleveland Congress, May 21. He succeeds Harry W. Dietert, Harry W. Dietert Co., Detroit. New vice president is Charles E. Nelson, technical director, Magnesium Div., Dow Chemical Co., Midland, Mich.

TO CLOSE: Eastern Malleable Iron Co. plans to close the foundry department of its Eberhard Mfg. Co. division's operations in Cleveland the end of June.

STEADY: March shipments of nonferrous castings were 77,014 tons, a decrease of 404 tons from February and about 30 per cent less than a year ago. Brass and bronze castings, which have shown a smaller drop from the 1957 pace than have aluminum castings, increased slightly in shipments during March.

MISCELLANY: March sales index of the Foundry Equipment Manufacturers Association was 85.9 per cent of the 1947-49 average, against 57.6 in February and 127 a year ago . . . American Smelting & Refining Co. has reduced the price for common lead from 12 cents a pound to 11½ cents, delivered New York . . . Gray Iron Founders' Society will hold sales training clinics June 16-18 at Dayton, Ohio, June 23-25 at Hartford, Conn., and June 30-July 2 at Rockton, Ill. . . American Malleable Castings Co., Marion, Ohio, has started production of pearlitic malleable iron castings . . . Merger of the Standard Fire Brick Co., Pueblo, Colo., into the A. P. Green Fire Brick Co., Mexico, Mo., has been approved . . . March bookings of material handling equipment were 97.9 per cent of the 1954 average, against 93.5 in February and 140.7 a year earlier, according to the Material Handling Institute . . . Primary aluminum production in April totaled 128,491 tons, compared with 137,916 in March and 139,152 a year ago. Total for four months of 531,918 tons compares with 540,947 tons last year.

Prices of Foundry Metals and Coke

(As of May 26, 1958)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$18.00-18.50
OVEN	
Birmingham	$28.85
Buffalo	30.50
Detroit	30.50
Erie, Pa.	30.50
Indianapolis	29.75
Kearny, N. J.	29.75
Milwaukee	30.50
Montreal, Que.	31.00
Neville Island (Pittsburgh)	29.25
New England, deld.	31.55
Painesville, O.	30.50
Philadelphia	29.50
St. Louis	31.50
St. Paul	29.75
Swedeland, Pa.	29.50
Terre Haute, Ind.	29.75

PIG IRON

(Per gross ton f.o.b. furnace)

	No. 2 Foundry	Malleable
Birdsboro, Pa.	$68.50	$69.00
Birmingham	62.50	66.50
Buffalo	66.50	67.00
Chester, Pa.	67.00	67.50
Chicago	66.50	66.50
Cleveland	66.50	66.50
Duluth	66.50	66.50
Erie, Pa.	66.50	66.50
Everett, Mass.	68.00	68.50
Fontana, Calif.	75.50	....
Geneva, Utah	66.50	....
Granite City, Ill.	68.40	68.90
Neville Island (Pittsburgh)	66.50	66.50
Swedeland, Pa.	68.50	69.00
Toledo, O.	66.50	66.50
Troy, N. Y.	68.50	69.00
Youngstown, O.	....	66.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 25.25; tin bronze, No. 225, 34.00; No. 245, 28.75; High-leaded tin bronze, No. 305, 29.25; No. 1 yellow, No. 405, 20.75; manganese bronze, No. 421, 23.00.

ALUMINUM: 99 per cent plus primary ingots 26.10. Secondary No. 12 alloy, 21.25-21.50. Deoxidizing grades: No. 1, 22.75; No. 4, 17.25.

MAGNESIUM: 99.8 per cent notched ingots 36.00, f.o.b. Velasco, Tex. (10,000 lb or more).

COPPER: Electrolytic 25.00, delivered Connecticut valley.

ZINC: High grade 11.00, delivered. Die casting alloy No. 3, 13.75; No. 2, 14.75, delivered.

IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$30.00-31.00	$48.00-49.00	....	....	....	....	$42.00-43.00
Boston*	**23.00-24.00	**28.00-29.00	....	....	**31.00-32.00	....	....
Buffalo	26.00-27.00	**39.00-40.00	....	....	**43.00-44.00	....	51.00-52.00
Chicago	34.00-35.00	40.00-41.00	....	45.00-46.00	45.00-46.00	48.00-49.00	49.00-51.00
Cincinnati*	**29.00-30.00	**38.00-39.00	**32.00-33.00	....	**45.00-46.00	....	**52.00-53.00
Cleveland	32.50-33.50	42.00-43.00	33.00-34.00	42.00-43.00	47.00-48.00	60.00-61.00	56.00-58.00
Detroit*	**24.00-25.00	**31.00-32.00	**23.00-24.00	**33.00-34.00	....	....	....
Los Angeles	34.00	**41.00	....	....	....	....	....
New York*	29.00-30.00	35.00-36.00	33.00-34.00	....	....	....	....
Philadelphia	34.00-35.00	38.00	40.00	....	47.00-48.00	58.00-59.00	56.00-58.00
Pittsburgh	32.00-33.00	40.00-41.00	....	40.00-41.00	48.00-49.00	....	53.00-55.00
St. Louis*	32.00	40.00	33.00	44.00	....	....	48.00
San Francisco	32.00	42.00	28.00	40.00	40.00	....	....
Seattle	27.00	31.00	28.00	....	....	....	....

*Brokers' buying prices. **F.o.b. shipping point

WHITEHEAD'S
MOISTURE CONTROLLED
NATURAL BONDED
DORCHESTER MOLDING SANDS AND GRAVELS

Guaranteed Moisture Content Not More Than 6%

LEADER IN FOUNDRY SANDS SINCE 1841

These natural bonded sands and gravels are widely used for Molds and Cores in Iron, Steel, Alloy, and Non-Ferrous Castings. They are noted for colloidal clay giving high green and dry strength. Because of low fines in the grain distribution, these sands have high permeability. Here are advantages you may expect from Whitehead's Naturally Bonded Moisture Controlled Dorchester Sands and Gravels.

1 ***Moisture Controlled Sands Do Not Freeze—***

a. Easier to unload . . . means lower unloading costs.
b. Reduces handling costs to and from storage bins.

2 ***Moisture Controlled Sands Are Economical—***

a. Sands with 15% moisture have 1700 lbs. sand and 300 lbs. water in each ton.
b. Moisture Controlled Sands with 6% moisture have 1880 lbs. sand and 120 lbs. water in each ton.
c. On each ton of Moisture Controlled Sands you *SAVE price of sand and freight on 180 lbs. of water.* Sand has just proper amount of moisture to eliminate dust hazard.

3 ***Ready for Use on Arrival at Foundry—***

a. Dorchester Moisture Controlled Sands and Gravels arrive with proper working moisture content so that they can be used at once.
b. Aids you in control of sands in foundry.

Whitehead Brothers COMPANY

Established 1841

NEW YORK OFFICE
324 West 23rd St., New York 11, N. Y.

NEW ENGLAND OFFICE
75 Westminster St., Providence 1, R. I.

Manufacturers of:

LYQUAGRIP
Ready-to-use core paste

DOB-IT
Ready-to-use core molding compound

JOINT-SEAL
Plastic compound for perfect sealing

LYQUAFLOUR
For cleaner surface, better shakeout

LYQUAFACE
The liquid sand grain coating

Circle 578 on Page 117

CHATEAUGAY PIG IRON ADDS STRENGTH, WEAR-RESISTANCE, EXCELLENT MACHINABILITY to ductile iron cast parts in the Fitchburg Chipper. The unit pictured can chew wood up to 4½" in diameter. Other models can take wood up to 8" in diameter.

Machine that "eats wood" offers more proof that...

CHATEAUGAY PIG IRON IS THE IDEAL BASE METAL FOR DUCTILE IRON CASTINGS

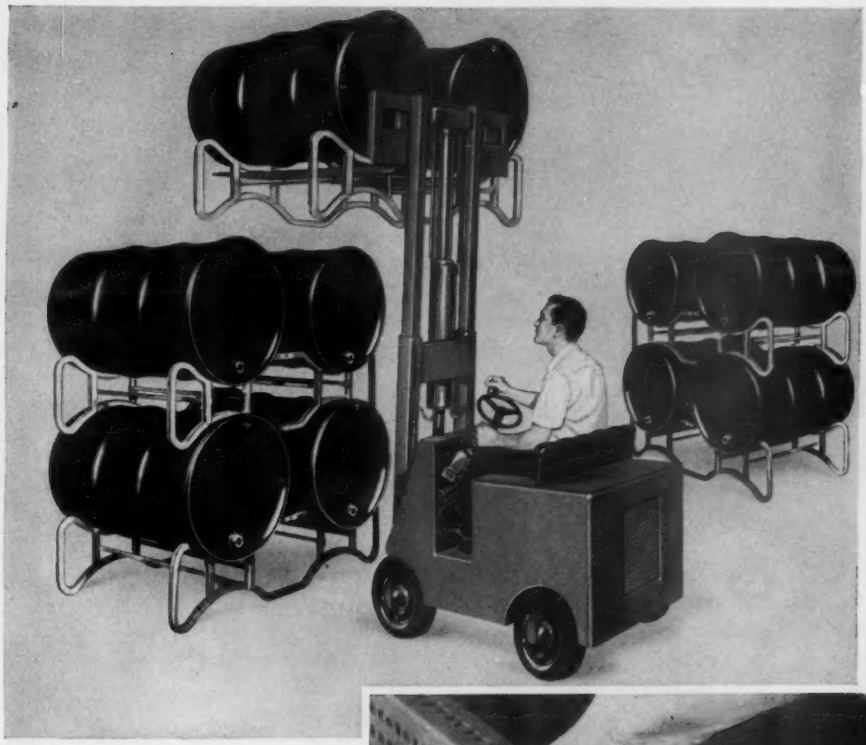
The Fitchburg Chipper, a machine that literally eats wood, is another example of the many benefits derived from the use of Chateaugay Pig Iron as the base metal for ductile iron castings. Designed and manufactured by the Fitchburg Engineering Corporation, Fitchburg, Mass., the machine is used by municipalities, utilities, farmers, and tree surgeons for on-the-spot disposal of wood wastes.

Many of the Chipper's parts, such as cutter head, feed plate, drive shaft, and frame are ductile iron castings. For increased strength, good surface, high wear-resistance, and better machinability, these parts are cast with Chateaugay as the base metal.

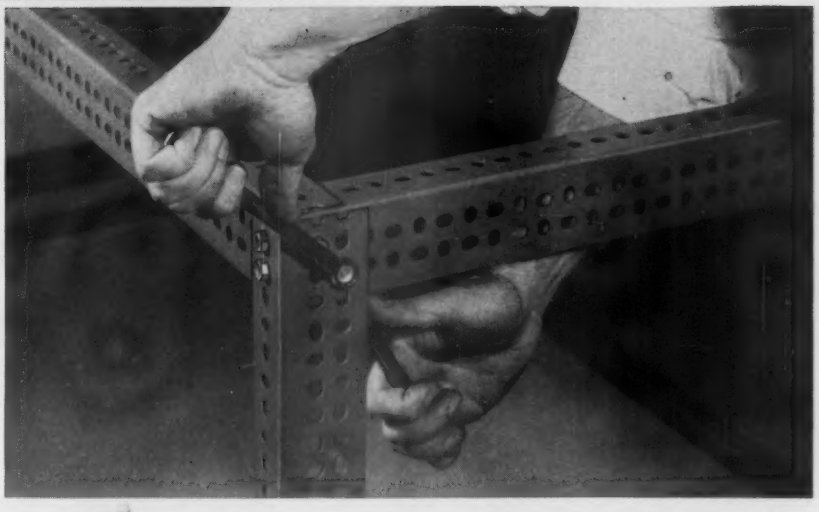
Chateaugay is perfectly suited for ductile iron use because of its high total carbon and unusually low phosphorus, silicon, and manganese content. The uniform distribution of chemical elements in Chateaugay assists in producing a dense grain structure which results in excellent wear-resistance and economical machining.

A Republic Pig Iron Metallurgist will give all the facts on Chateaugay for ductile iron use as well as complete details on other Republic Irons. Republic, only producer of both Northern and Southern Iron, offers industry's only complete line of merchant pig irons. Northern grades include Malleable, Bessemer, Foundry, and Basic. Southern furnaces produce Foundry and Basic.

Send the coupon today for prompt, expert metallurgical service, or for more information on Republic's complete line of irons.



REPUBLIC PROVIDES THE IDEAL WAY TO STACK DRUMS. This new portable drum rack, designed and manufactured by Republic's Berger Division, can accommodate more in-use drums in less floor space than was ever before possible. Each steel cradle supports two loaded 55-gallon drums, permitting orderly stacking of pairs of drums to any practical height. Standard fork-lift trucks can pick up, move, and stack as many tiers of drums at one time as lifting capacity permits. Low in cost. Shipped knocked down flat with bolts for easy assembly. Send the attached coupon for more facts.



HERE'S THE PRACTICAL AND IDEAL SOLUTION for all your framing requirements. It's BILD-A-FLEX, the new slotted construction angle, designed and engineered by Republic's Berger Division. Use BILD-A-FLEX for catwalks, supports, guard rails, special purpose tables and stands, scaffolding. Simply plan your layout, cut BILD-A-FLEX, join with bolts. The secret is in the precision engineered, unique system of short slots, placed to allow ¾" vertical and horizontal adjustment. Every BILD-A-FLEX construction angle is Bonderized and finished with baked enamel *after fabrication*. Shipped in convenient bundles of 10 angles, in .080 gage or .104 gage, 10- or 12-foot lengths. One bundle stores in same space as 2" x 4" piece of lumber. Send coupon for catalog packed with ideas.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
DEPT. FO-5504
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

☐ Have a Pig Iron Metallurgist call.
Send more information on:
☐ Chateaugay ☐ Northern Irons ☐ Southern Irons
☐ Drum Racks ☐ BILD-A-FLEX Angles

Name_____ Title _____
Company _____
Address _____
City _____ Zone ____ State _____

Circle 579 on Page 117

KEYSTONE

Keystone's close personal attention gets the results you want . . . fast

We have always regarded you, our customers, as individuals with individual needs. This may be a little old fashioned in this era of push-button automation, but it works. It pays off in increased production, longer wheel life, faster service—we'll ship your order within the hour . . . make overnight deliveries anywhere in the East. Try our unique brand of personalized service. Call us today!

Keystone
ABRASIVE WHEEL COMPANY
Carnegie, Pennsylvania • Phone: WAlnut 1-7036

Speed production of grey iron castings

EXCELLENT FLOWABILITY of Dexocor binder sand mix gives uniform structure throughout cores—and draws are made easily without sticking.

A large midwestern grey iron foundry finds that:

*"Cores made with Dexocor baked through in 40 to 50 per cent less time—saving fuel dollars and permitting more flexible production scheduling. In addition, green cores, even with high stands or overhang, held perfect shape. Cracking of cores, gas defects and metal penetration were virtually eliminated."

—Dexocor offers other advantages: Better moisture control, excellent flowability, quick, easy mixing, blowing, ramming, easy shake-out—especially when used with Mogul or Kordek binder.

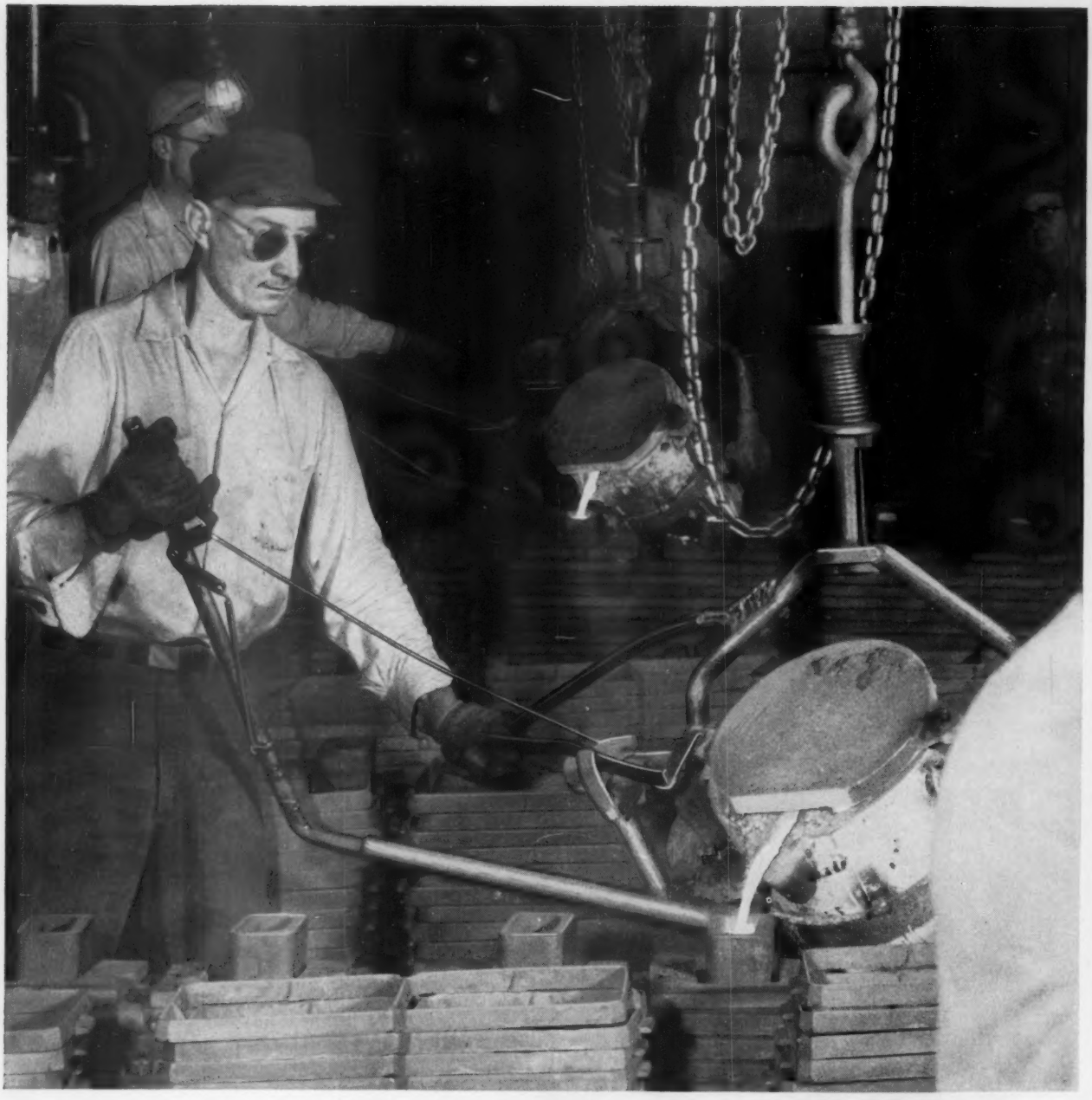
Ask for detailed information and technical help in utilizing this new miracle binder. Contact our nearest sales office.

*Source on request.

DEXOCOR® Binder

Other fine products for the Foundry Industry: MOGUL® and KORDEK® Binders • GLOBE® Dextrines

CORN PRODUCTS SALES COMPANY • 17 Battery Place, New York 4, N. Y.



On the pouring floor of the No. 2 Foundry Unit at Sparta, twenty conveyor lines are poured by 3 ladles

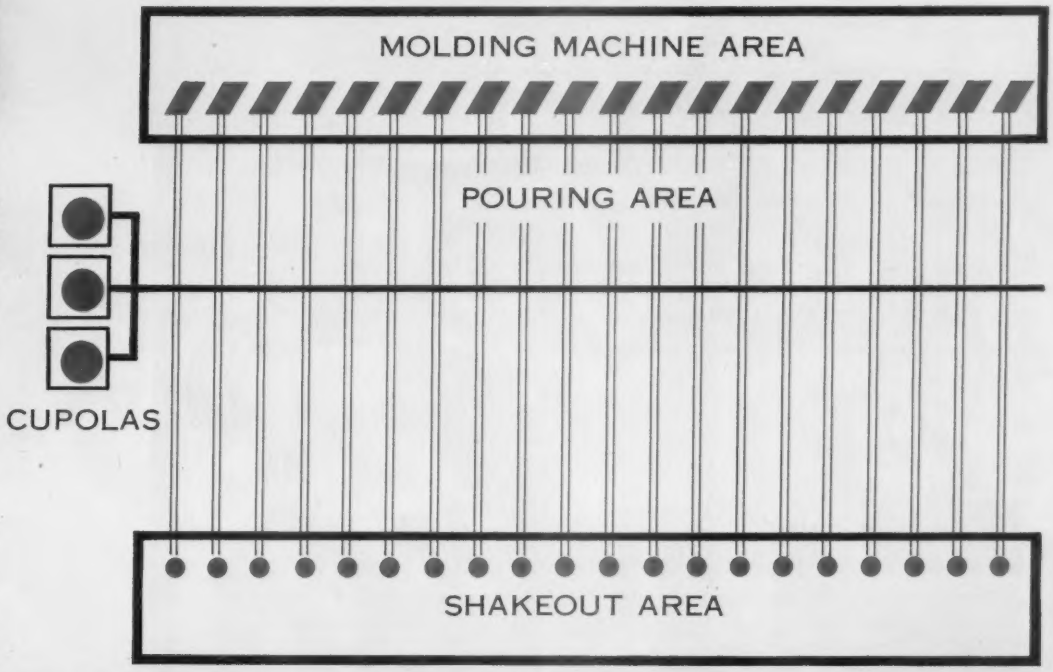
At Sparta Foundry—1 million piston rings a day prove the quality of HANNA PIG IRON

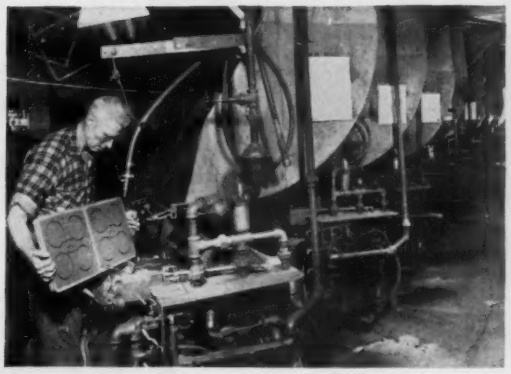
Sparta Foundry Company, a division of Muskegon Piston Ring Company, in Sparta, Michigan, can cast up to 1,000,000 piston rings in a single day. Since 1926, it has produced over three billion rings. In castings for piston rings, which will be ground to a close tolerance, Sparta Foundry demands a strong, fine-grained iron with uniform microstructure. For pig iron sure to produce this quality, Sparta Foundry has relied on Hanna for more than 30 years.

Hanna makes all regular grades of pig iron, plus HannaTite and Hanna Silvery. All are available in two sizes—the 38-pound pig and the smaller HannaTen ingot. Your Hanna representative will be glad to tell you more about the advantages of using Hanna pig iron.

Sparta's operation accents both quality and quantity

This flow chart shows the multiplicity of Sparta's continuous production lines. Twenty molding machines, twenty continuous conveyors, and multiple shakeout stations are part of the operation.





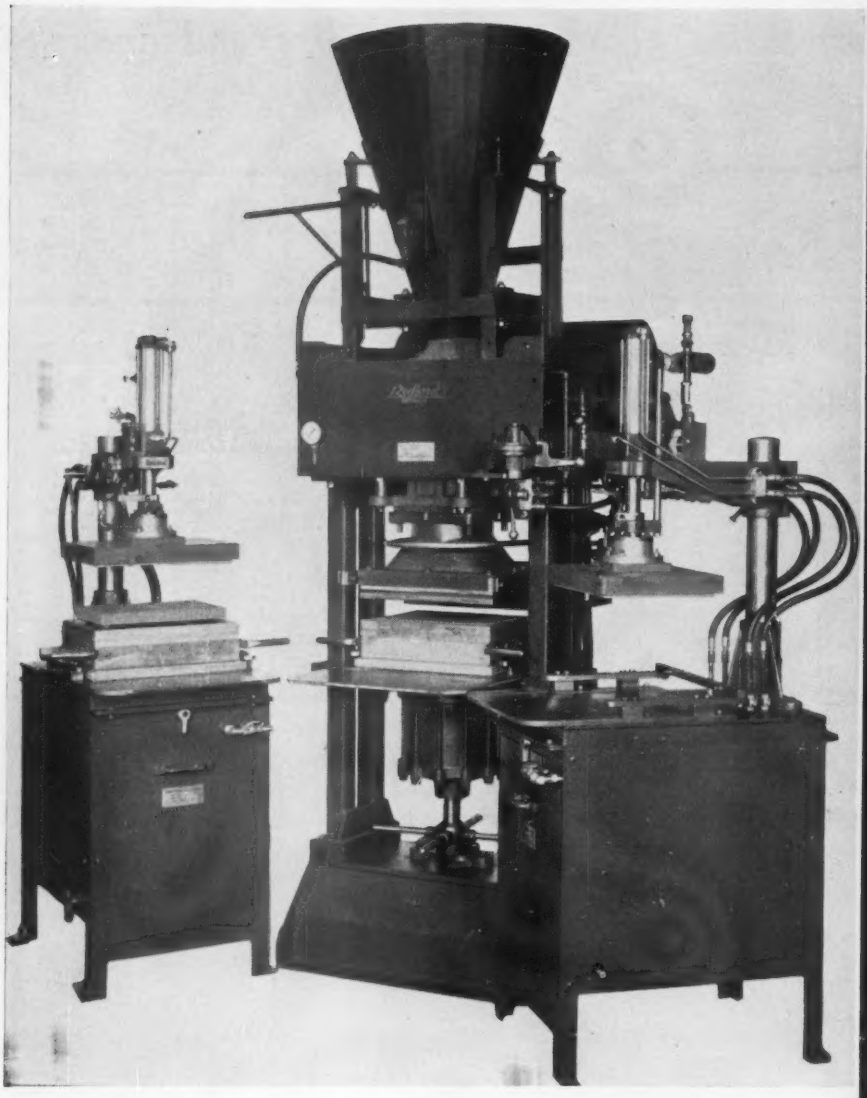
1. *Sparta's No. 2 battery of 20 molding machines. From here, conveyors carry the completed molds to the pouring floor.*

2. *From pouring floor, conveyors take castings to shakeout. After shakeout, piston rings are removed from the "tree."*

THE HANNA FURNACE CORPORATION
Buffalo • Detroit • New York • Philadelphia
Merchant Pig Iron Division of
NATIONAL STEEL CORPORATION

3. *Uniformity and quality are carefully checked in the Sparta laboratories with instruments like this latest Metallograph.*

Circle 582 on Page 117



REDFORD CO_2 MOLD MAKING EQUIPMENT

Here is a proven way of applying the CO_2 process to the production of small castings. With the above Redford #420-D Core Blower and (2) Model H-2-M Gassing Stations, one mold is being blown and squeezed while another one is automatically gassed and stripped. Up to 80 complete molds (cope and drag) are produced in one hour. Molds are flat and can be stacked for pouring. Metal yield is greatly increased. Very little floor space is required. Millions of small parts have been cast to close tolerances at reduced costs. For complete information write for BULLETIN No. 421.

Redford **IRON & EQUIPMENT CO.**
20733 Glendale • Detroit 23, Michigan
Phone: KEnwood 1-8611

TYPICAL CO_2 MOLD CASTINGS

½ Actual Size

which car do you want?

Plymouth FURY

Chevrolet CORVETTE

Ford 4-passenger THUNDERBIRD

WIN YOUR CHOICE IN NEW PANGBORN CONTEST

Celebrating the successful introduction of new

Pangborn

Rotoblast® Steel Shot

FOLLOW THESE SIMPLE RULES:

1. Anyone employed by a company using blast cleaning equipment is eligible for this contest, except employees of Pangborn Corporation, its agencies or affiliates.
2. Check Rotoblast Steel Shot ad in this issue for answers and fill in missing words on the Official Entry Blank.
3. Sign your entry and mail to Pangborn Corporation, Hagerstown, Md. Entries must be postmarked not later than the 4th of July, 1958.
4. All entries with correct answers will be deposited in a container from which the lucky winner will be drawn and awarded his choice of Ford Thunderbird, Chevrolet Corvette or Plymouth Fury.

OFFICIAL ENTRY BLANK

PANGBORN CORPORATION, Hagerstown 5, Maryland

In new ROTOBLAST STEEL SHOT, voids and defects are virtually eliminated by a new shot manufacturing process called _____ Casting.

Continuous heat treating in a controlled atmosphere gives you _____ hardness and _____ life. Result: faster cleaning and lowest blast cleaning costs ever.

Name..... Title.....

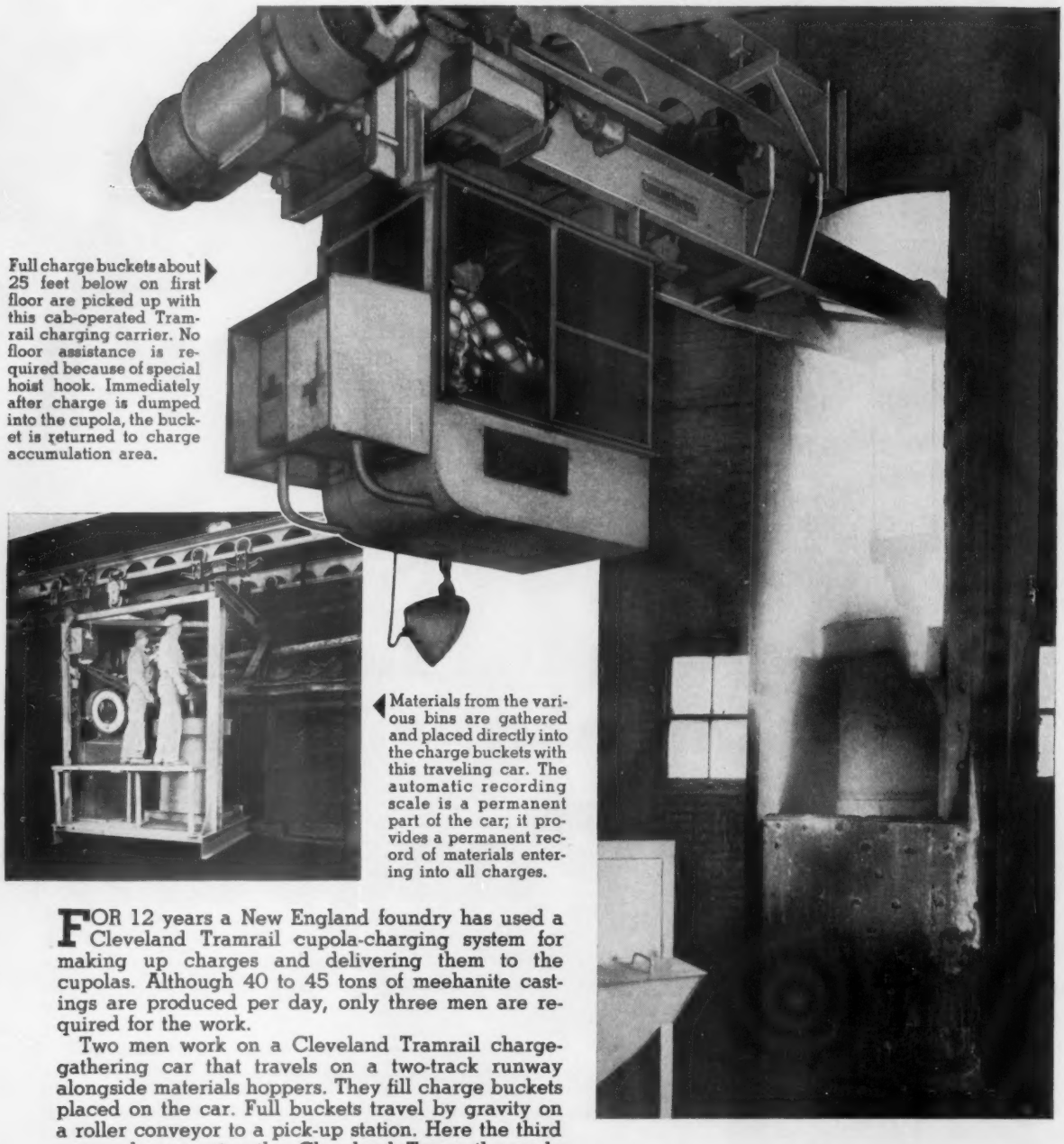
Company.....

Address.....

City..... Zone..... State.....

A Simple Efficient Cupola Charging System

Serves Foundry Producing 45 Tons Castings Daily



Full charge buckets about 25 feet below on first floor are picked up with this cab-operated Tramrail charging carrier. No floor assistance is required because of special hoist hook. Immediately after charge is dumped into the cupola, the bucket is returned to charge accumulation area.

Materials from the various bins are gathered and placed directly into the charge buckets with this traveling car. The automatic recording scale is a permanent part of the car; it provides a permanent record of materials entering into all charges.

FOR 12 years a New England foundry has used a Cleveland Tramrail cupola-charging system for making up charges and delivering them to the cupolas. Although 40 to 45 tons of meehanite castings are produced per day, only three men are required for the work.

Two men work on a Cleveland Tramrail charge-gathering car that travels on a two-track runway alongside materials hoppers. They fill charge buckets placed on the car. Full buckets travel by gravity on a roller conveyor to a pick-up station. Here the third man, who operates the Cleveland Tramrail cupola charging carrier, lowers the hoist hook from the floor above and picks up the buckets. These are delivered to one of the two cupolas and materials discharged through the bucket bottoms.

Only three charging buckets are required, yet nine tons are melted per hour. The system has proven fast, efficient and easy to maintain.

CLEVELAND TRAMRAIL

Overhead Materials Handling Equipment

Write for free booklet 2008

CLEVELAND TRAMRAIL DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 3849 E. 286 ST. • WICKLIFFE, OHIO

You have never used abrasive like this new

ROTOBLAST® STEEL SHOT

1 Vacuum Casting

Electric furnace alloy steel, shotted in revolutionary new vacuum chamber for greater density, eliminating the voids and defects encountered in conventional steel shot. Gives you a fatigue resisting shot of much longer wear life.

2 Continuous Heat Treating in Controlled Atmosphere

Nothing like it in the industry. Uniform heating of every particle, in zero oxygen atmosphere. For the first time . . . ball bearing heat treating quality in a tonnage product . . . gives you uniform hardness and longer life.

New Rotoblast Steel Shot gives you much faster cleaning and the lowest blast cleaning cost ever!

Schedule an early test! Talk to the Pangborn Engineer in your area or write PANGBORN CORP., 1400 Pangborn Blvd., Hagerstown, Md.

Pangborn

Rotoblast Steel Shot

Circle 585 on Page 117

the Clearfield Mixer

This No. 404 Clearfield Mixer has been in operation for eight years in the core shop of the Railway and Industrial Engineering Co. of Greensburg, Pa., makers of electrical switchgear for substations and generating stations. During that time it has required only very few minor repairs and "has paid for itself many times over."

gives

you

BETTER

FOUNDRY

SAND

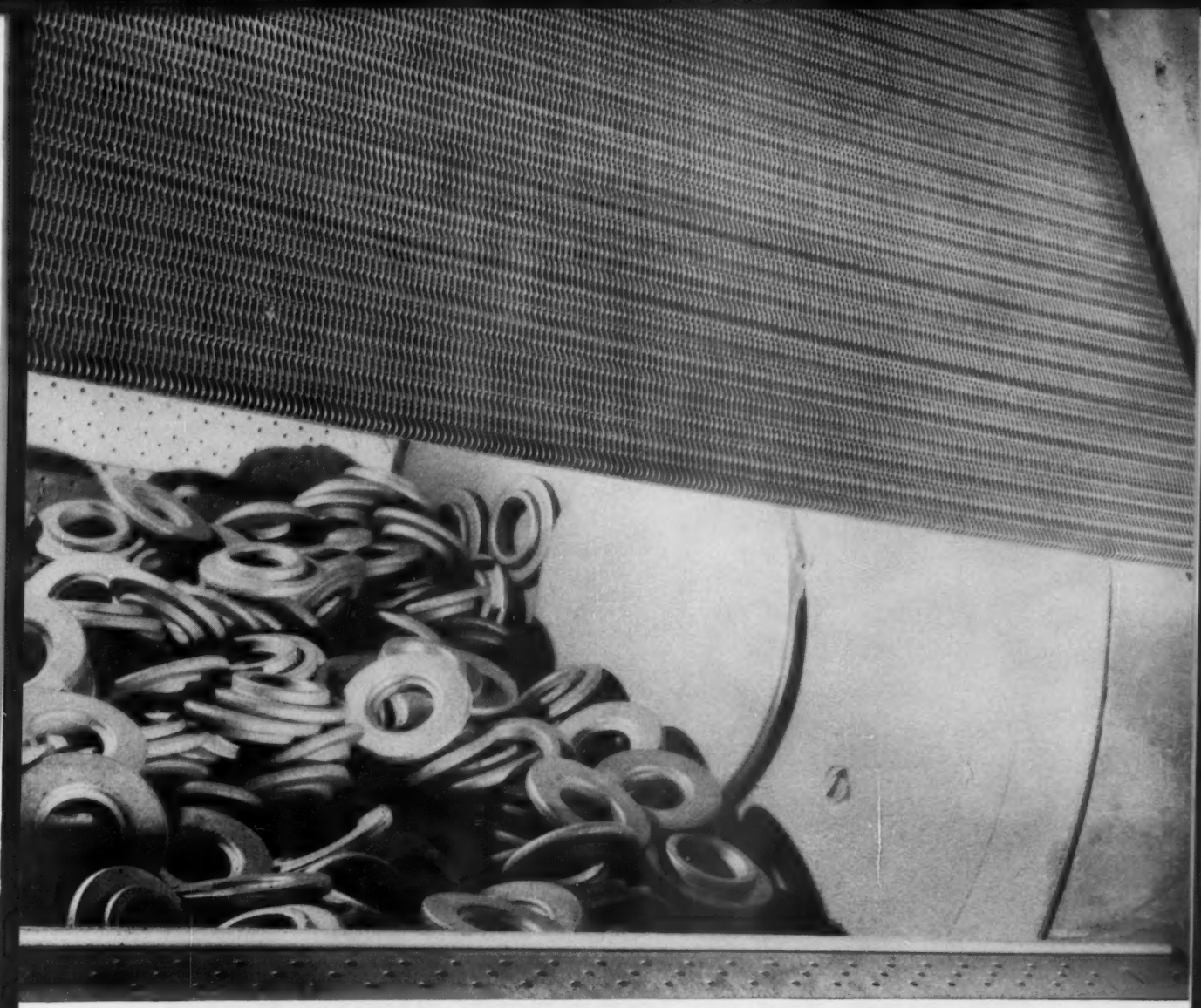
Better, because bond and moisture are uniformly distributed. By breaking down all lumps, caking is eliminated, freeing all material from the bottom surface. Clearfield Mixers, with vertical rotating mullers and unique rotating pans, are faster in performance and result in better production.

Write for Catalog No. 83. Gives full details on the Clearfield Mixer for your need.

CLEARFIELD MIXER

fast,
thorough
sand preparation

CLEARFIELD
MACHINE COMPANY
CLEARFIELD
PENNSYLVANIA, U. S. A.



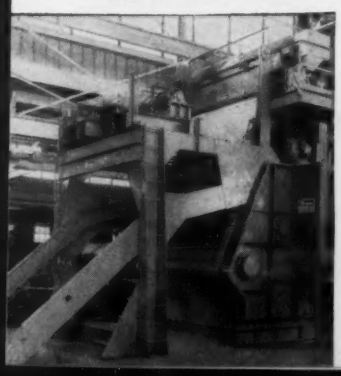
When this door comes down . . . so does your blast cleaning cost!

Abrasive-tight door on Rotoblast Barrel slashes "lost abrasive" costs

Look at it. That door on the Pangborn Rotoblast Barrel is engineered to prevent waste. Tough woven steel chain construction . . . laminated rubber back . . . edges that roll in mechanical labyrinths—it has to be abrasive-tight! As a result, here is another way that Pangborn Rotoblast Barrels save you money.

This door is just one of the many benefits built into Rotoblast Barrels. Efficient Rotoblast operation, for example. Automatic control. Ease of maintenance. Plus specific construction features that all add up to *better* cleaning in *less* time for *lowest* cost per ton.

Pangborn Rotoblast Barrel for efficient batch cleaning. Available in 1½, 3, 6, 12, 18, 20, 32, 72 and 102 cubic foot sizes.

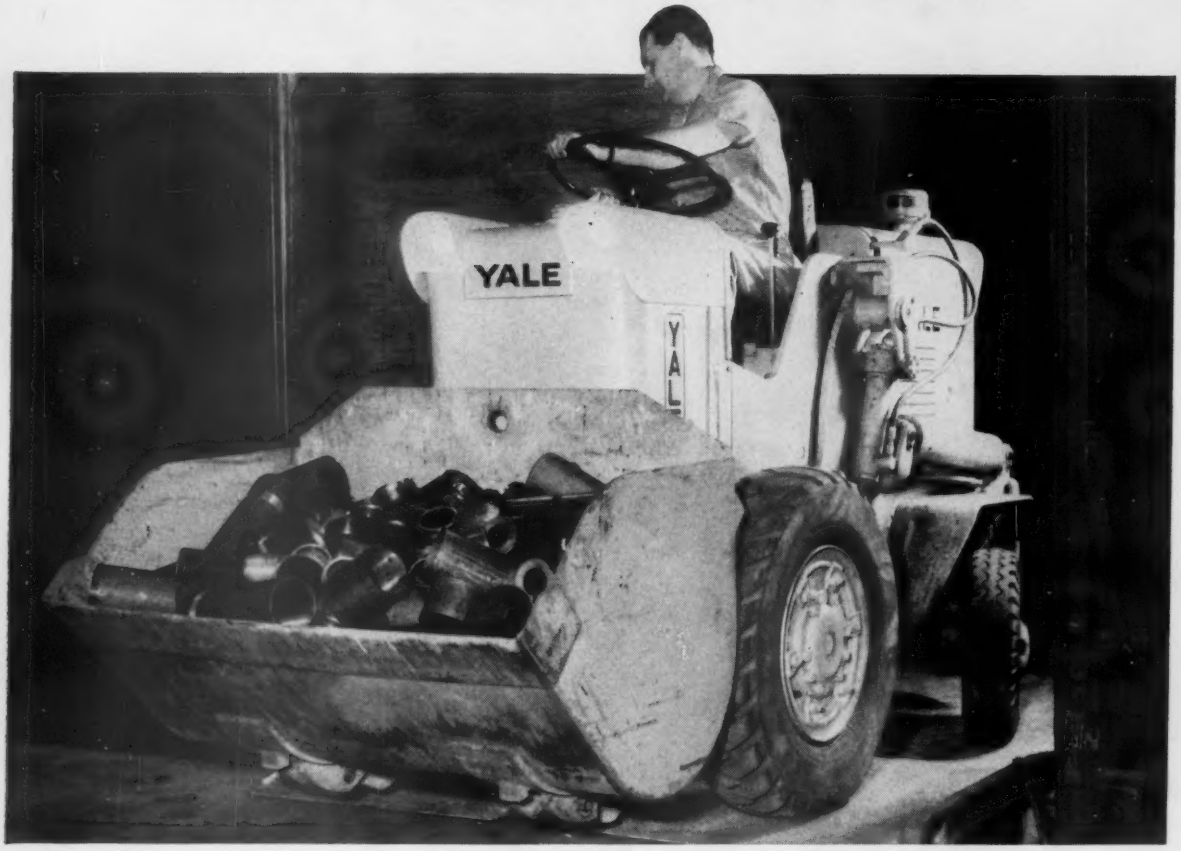


The Pangborn Engineer in your area will be glad to take off his coat and go to work on your cleaning problem at no obligation. And for complete information on Rotoblast Barrels, write to: Pangborn Corp., *1400 Pangborn Blvd., Hagerstown, Md. Manufacturers of Blast Cleaning & Dust Control Equipment.*

Clean it fast with **Pangborn ROTOBLAST®**

Circle 587 on Page 117

NEW YALE INDUSTRIAL TRACTOR SHOVEL



Carries more tonnage every hour

—field tests prove it!

Actual field tests prove the amazing work-capacity of the new Yale Industrial Tractor Shovel. Extra tonnage—extra work—extra duty cycles! Operating acceleration speed is 8 mph in 3.5 seconds. And Yale's exclusive fully automatic Torque Transmission produces quicker, smoother starting, more power under load conditions.

Loader-linkage advantages are unique. Exclusive 45° ground-level tipback provides top loading action, minimum spillage in grade-level position. Exclusive 6′ dumping clearance (highest on any model of similar wheelbase) automatically returns bucket from full dump position to dig position.

Let your operator work with it. He'll like the roomy, clear cockpit—the finger-tip controls—the ease of handling—the fact that there are no gears to shift. He'll especially like Yale's exclusive Safety-Curve Arms—that never rise above the side frame to cause injury. For a demonstration in your plant or further data write The Yale & Towne Manufacturing Co., Philadelphia, Pa., Dept. A-346.

COMPARE THESE YALE FEATURES:

- Exclusive Yale Torque Transmission (fully automatic)
- Exclusive 45° ground-level bucket tipback
- Exclusive 6′ dumping clearance
- Exclusive Safety-Curve Arms
- Exclusive acceleration speed to 8 mph. in 3.5 sec.
- Exclusive sealed brakes
- Exclusive forward and rear operating lights
- 2500 lbs. carrying capacity
- Short wheelbase for minimum turning radius
- Gasoline or LP-Gas powered

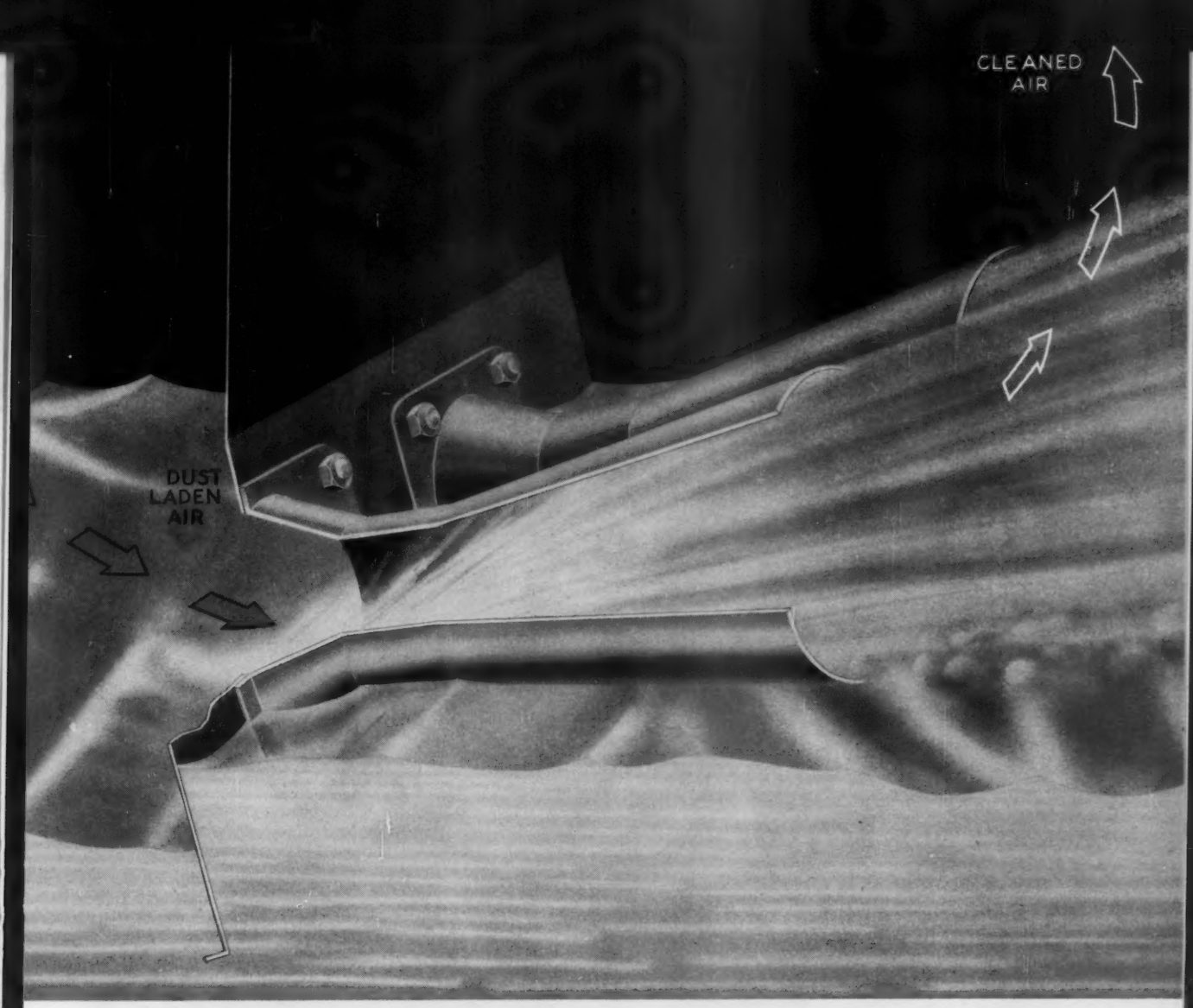
YALE* *REG. U.S. PAT. OFF.

YALE & TOWNE

INDUSTRIAL LIFT TRUCKS & TRACTOR SHOVELS • HOISTS

GASOLINE, ELECTRIC, DIESEL & LP-GAS INDUSTRIAL LIFT TRUCKS • WORKSAVERS
WAREHOUSERS • HAND TRUCKS • INDUSTRIAL TRACTOR SHOVELS • HAND AND ELECTRIC HOISTS

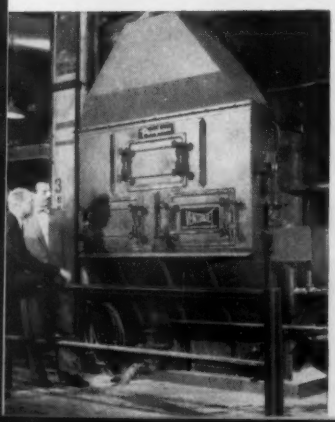
YALE MATERIALS HANDLING DIVISION. THE YALE & TOWNE MANUFACTURING CO. MANUFACTURING PLANTS: PHILADELPHIA, PA.; SAN LEANDRO, CALIF.; FORREST CITY, ARK.



Puts the squeeze on difficult dusts

Pangborn Ventrijet Wet Dust Collector uses exclusive venturi tubes for peak efficiency

Pangborn Ventrijet Wet Dust Collector on the job. This is just one of Pangborn's comprehensive line of wet and dry dust collectors.



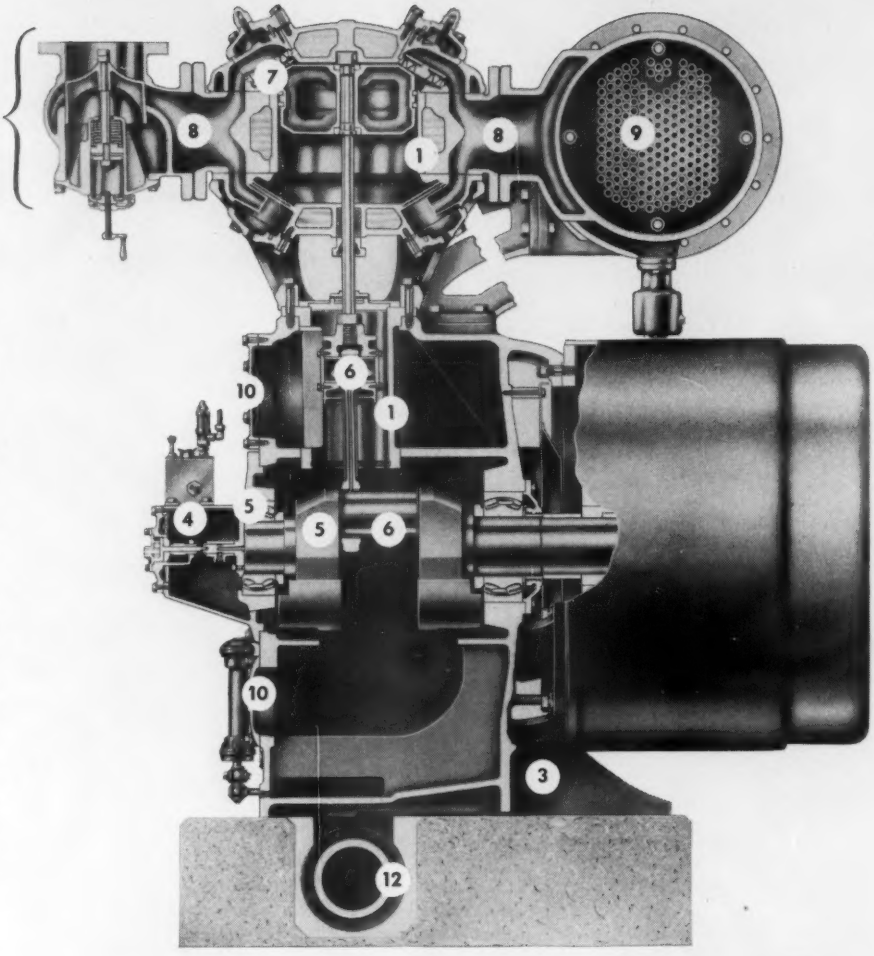
That pinch-necked venturi tube is the secret behind Pangborn Ventrijet performance. As dust-laden air flows through these tubes, the constriction creates a low-pressure area which draws water into the air stream. The resulting turbulence breaks the water into particles which actually *wash* the dust from the air. The simplicity of Ventrijet design saves money in its ease of installation, its low cost of operation and maintenance.

Although the Ventrijet is particularly suited to collecting hot, moist, inflammable, corrosive and obnoxious dusts, the Pangborn engineering it typifies is important to *any* dust-producing plant. It is not enough to put a dust collector within a plant. An efficient dust control system must be *scientifically* planned, designed and constructed to handle effectively a specific dust problem. This thinking is incorporated into every Pangborn proposal.

The Pangborn Engineer in your area will be glad to go to work for you. He is a dust expert *and will discuss your individual problem at no obligation. And, for more information, write for Bulletin 922 to:* Pangborn Corp., *1400 Pangborn Blvd., Hagerstown, Md. Manufacturers of Dust Control and Blast Cleaning Equipment.*

Pangborn CONTROLS DUST

Circle 589 on Page 117



1. Honed, replaceable crosshead and cylinder liners of special alloy iron.
✓ One-piece, box type tinned cross heads—NO ADJUSTMENT NECESSARY.
3. Scientifically ribbed, broad based main frame of semi-steel.
4. Integral force-feed running gear lubrication through rifle-drilled passages. Separate force-feed system for cylinders.
5. Heat-treated, drop-forged crankshaft and spherical-roller-type main bearings. NO ADJUSTMENT NECESSARY.
6. Precision type, steel back crankpin bearings and bronze crosshead pin bearings, force-feed lubricated.
7. Patented "Dual-Cushion" Valves—large area, low lift, durable, efficient and quiet, set at most efficient angle in both heads.
8. Large, streamlined air passages minimize friction losses, reduce power consumption.
9. Dual copper tube intercoolers with cast iron shell for quiet operation, true counter flow design and built-in moisture separator.
10. Convenient inspection openings with dust proof, oil-tight covers.
✓ Water jacket cleanout openings.
12. Discharge piping furnished provides single outlet for easy installation.
13. Standard Joy total closure control provides lowest possible power consumption. Other control systems available.

Mr. Engineer: Here are some BUY features of JOY AIR COMPRESSORS

There are three major by-products of the BUY features listed above; they are savings in *installation, maintenance* and *operation.*

INSTALLATION: Because of "Packaged" design, Joy Compressors are shipped ready to hook up and run. No assembly needed. And you save up to half the normal cost because Joy Compressors require less foundation.

MAINTENANCE: All wearing parts—valves, crosshead guides, cylinder liners, etc.,—are field replaceable. This is an exclusive Joy feature. No special tools or special maintenance crew training required.

OPERATION: Precise balance and control requires less horsepower than any other system, delivers greater economy on CFM and KWH per HP.

Joy Compressors range from 1.93 to 6048 CFM with wide choice of Prime movers and drives. Write **Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.** Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

WRITE FOR FREE BULLETIN 242-13

JOY *Saves you money on AIR*

COMPRESSORS • FANS • DUST COLLECTORS

WSW I 7162-242

Circle 590 on Page 117

Circle 591 on Page 117→

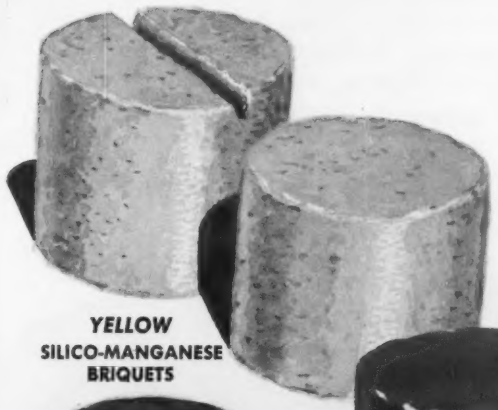
ELIMINATE ACCIDENTS

USE COLOR-CODED BRIQUETS

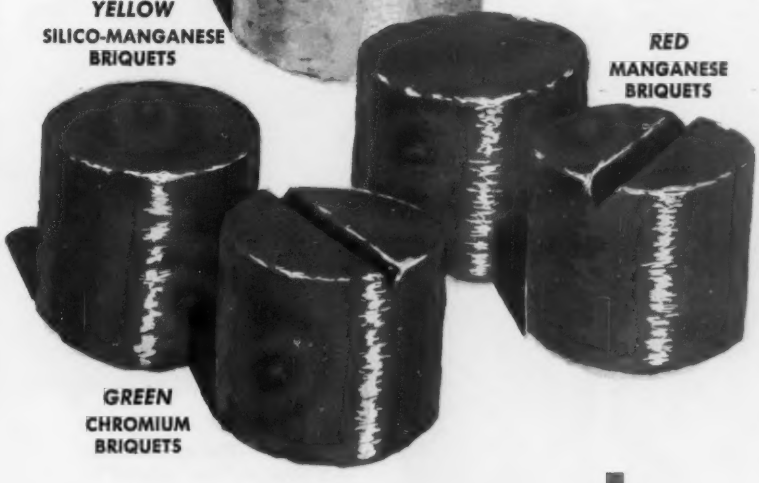
Briquets** are the **most convenient** method of adding alloys to the cupola charge—**additions** are made **by count** and **weighing** is **eliminated.

Like other briquets, all Ohio Ferro-Alloys briquets contain an *exact* weight of alloy. But, only the unique OFAC system of *Color Coded Briquets* can offer you positive identification of the different elements. Like the stoplight, it's the time-tested system of control.

Write for Your FREE Copy of our brochure —
"BRIQUETS IN THE IRON FOUNDRY"

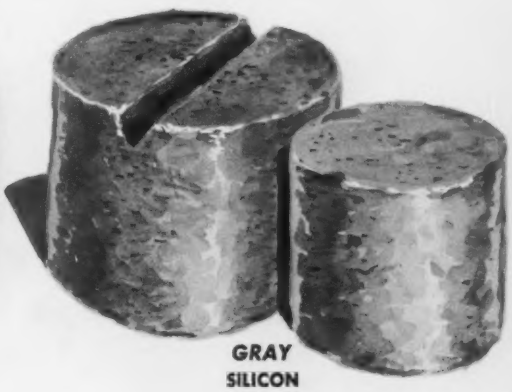


YELLOW
SILICO-MANGANESE BRIQUETS



RED
MANGANESE BRIQUETS

GREEN
CHROMIUM BRIQUETS



GRAY
SILICON BRIQUETS

SALES OFFICES

Birmingham • Chicago • Detroit • Los Angeles • Philadelphia • Pittsburgh • San Francisco • Seattle • Denver • Minneapolis

Ohio Ferro-Alloys Corporation
Canton, Ohio

1904—In this modest 3000 sq. ft. plant, Thomas L. Smith, early leader of our company, with 10 Sterling men, began the manufacture of wheelbarrows.

an old friend with a new name

Sterling is pleased to announce a change in the company name. Instead of *Sterling Wheelbarrow Company* . . . a familiar and respected name throughout the foundry industry . . . the firm will hereafter be known as

STERLING NATIONAL INDUSTRIES, INC.

MILWAUKEE 14, WISCONSIN, U. S. A.

Sterling

Foundrymen may have wondered why the name Sterling Wheelbarrow Company . . . why not call it Sterling Foundry Equipment Company. Originally . . . as far back as 1904 . . . Sterling produced wheelbarrows, exclusively. The company did an excellent job of designing and building wheelbarrows for "roll easy" heavy duty performance. This inspired demands from the trade for other Sterling equipment and paved the way for the well-known line of Sterling Foundry Flasks and other foundry equipment.

Today, Sterling has a world-wide reputation for high quality, engineered-to-the-job design. And the extensive Sterling line of foundry equipment, including wheelbarrows, carts and trucks, meets a wide range of standard applications. In addition, equipment can be custom-built to meet special foundry requirements.

Sterling National Industries desires to continue the Sterling policy of working for the welfare and progress of the foundry industry, and to produce equipment that meets the highest quality standards.

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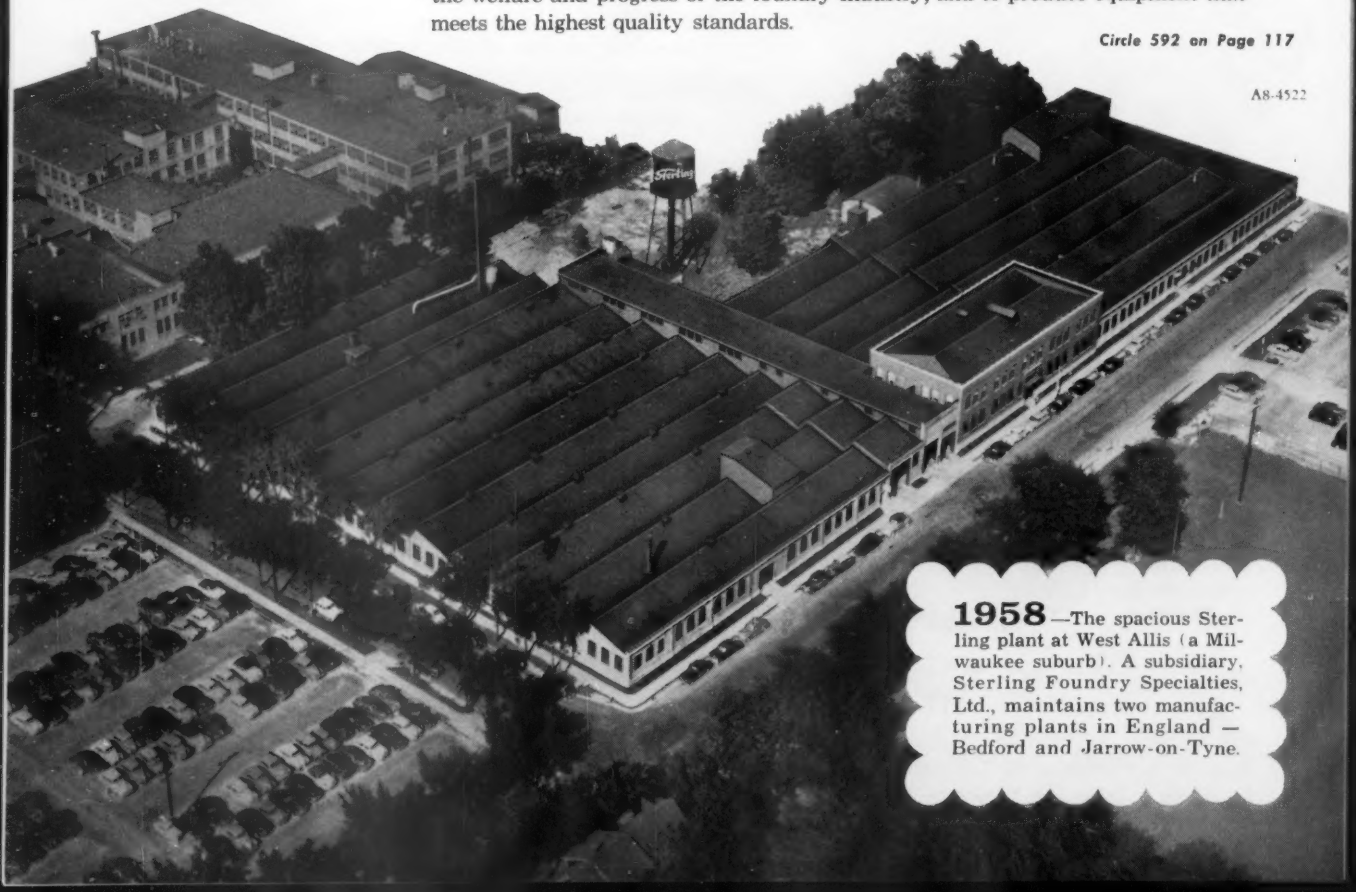


1958—The spacious Sterling plant at West Allis (a Milwaukee suburb). A subsidiary, Sterling Foundry Specialties, Ltd., maintains two manufacturing plants in England — Bedford and Jarrow-on-Tyne.

WHEREVER METALS ARE CAST . . . FOUNDRY

June 1958

Backbone Needed

With foundry business continuing to drift at a low level, unrealistic price cutting appears to be growing. Castings are being sold below the cost of production, and this practice is spreading. Some quotations are too low because the foundrymen do not know costs. Others are being made below cost for volume purposes. Finally, castings are being sold below cost because purchasing agents of large users, while professing a desire to see the foundryman make a fair profit on his castings, actually will not let him do it.

Cut-throat competition is especially prevalent in quotations for new jobs. Reports from various sections of the country indicate that new work is being taken at fantastically low prices. Experience has shown that prices for new business soon will become the factor governing all castings sales.

The problems created by the present castings price situation are quite complex and very real. That disaster faces some foundries is emphasized by the number of companies closing their doors. Unless satisfactory methods are found to solve the price problem, more will be missing by the time the recession is over.

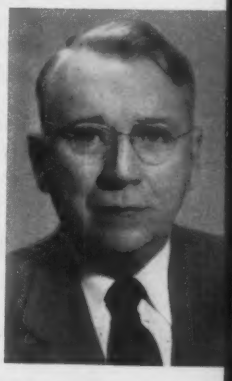
It must be recognized that pressure has developed for price concessions in both capital goods and consumer durables. These are the fields where castings find their greatest application. Therefore manufacturers of such goods have passed along this pressure to suppliers of castings and other components. But the record of earnings in good years proves that most foundries cannot provide such concessions without countermeasures to reduce costs.

Now is the time that foundries *must* eliminate costly habits that developed when business was rushing and buyers were not quite as price conscious. Practices which waste materials and labor must be corrected. Equipment must be kept in proper shape for economical operation. Overhead must be reduced to the minimum. Latest knowledge in methods of producing castings should be studied carefully, and those which are applicable should be adopted. In fact, every facet of castings production should come under close scrutiny.

Increased efficiency, reduction of waste, and more backbone in resisting unfair pressure should help foundrymen meet the present problems of price.

Frank G. Steinebach

Editor



Risering of Steel Castings With Exothermic Sleeves

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What Exothermic Riser Sleeves Can Do

From experiments with moldable exothermic riser sleeves, the authors derive these conclusions:

1. Replacing an uninsulated riser with an exothermic riser sleeve permits reduction in riser diameters by as much as 50 per cent, depending on sleeve thickness used.

2. Use of exothermic sleeves can reduce riser volume, compared with uninsulated risers, by as much as 90 per cent, depending on sleeve thickness and the casting's geometry.

3. Chunky castings can be fed completely with exothermic risers having volumes, as poured, of only 10 per cent of the casting volume.

4. Efficiency of a unit weight of moldable exothermic material decreases as sleeve thickness and riser diameter increase.

5. Risers made with moldable exothermic materials have a slightly greater feeding range than those of the larger uninsulated risers which they replaced.

EXACT rules for dimensioning risers on steel castings to obtain maximum yield, have been presented in previous publications.[1,2] These data pertain only to cases where the casting-riser system is surrounded by sand except for the top of the riser, which is covered with a mildly exothermic riser compound.

Under those conditions, it was shown that the riser volume needed to feed a steel casting is a function of the surface area to volume ratio of the casting. A casting having a low ratio, such as a cube, requires an initial riser volume which is often larger than the casting volume. Castings with geometries such that higher SA/V ratios exist can be fed with risers of relatively smaller volumes.

In recent years, refractory exothermic materials have been developed which can be formed into sleeves and incorporated into molds to form the riser cavities. When molten steel comes in contact with these sleeves, they react exothermically and develop temperatures of approximately 2950° F. The heat-producing ingredients in the sleeves are those necessary for the classic thermit reaction—metal oxide and aluminum powders. The material also contains refractories and high-temperature binders, so that after the reaction is completed the sleeves become mechanically strong insulators. Such exothermic materials around risers, of course, retard their solidification and permit castings to be made with smaller volumes of riser metal.

The investigation described here was intended to promote the most efficient use of moldable exothermic materials in risering practice by determining: 1. The extent to which riser diameters can be reduced when these materials are employed. 2. The extent to which riser volumes can be reduced under such conditions. 3. The influence of the exothermic materials on feeding range.

Riser Diameter Studies—To feed a casting completely, a riser must have not only the necessary volume but also a solidification time greater than that of the casting. In practice, the solidification time of a riser generally is controlled by varying its diameter. Since the minimum diameter of uninsulated risers needed to feed castings of various shapes has been established,[1,2] the problem of replacing a riser surrounded by molding sand with a smaller diameter riser surrounded by exothermic material becomes one of matching riser solidification time for the two cases.

Editor's Note: This paper was presented at the 1957 T & O Conference of the Steel Founders' Society of America.

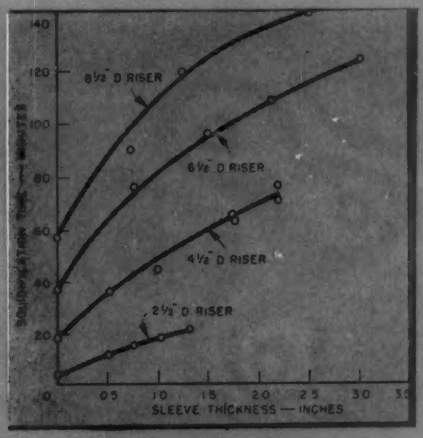

Fig. 1—Effect of moldable exothermic sleeve thickness on solidification times of risers of various diameters

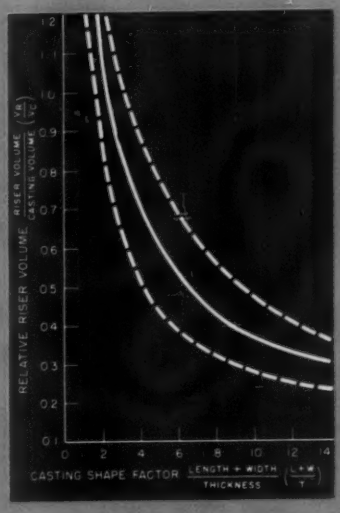

Fig. 3—Relation of casting shape factor to minimum effective riser volume as a fraction of casting volume (for uninsulated risers)

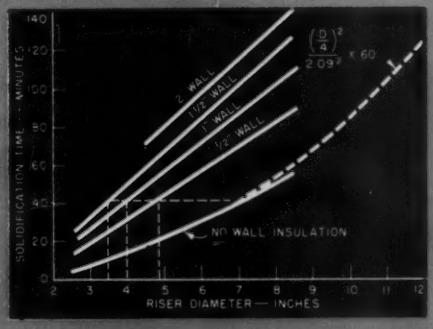

Fig. 2—Combinations of riser diameter and thickness of exothermic insulation which match solidification times of uninsulated risers

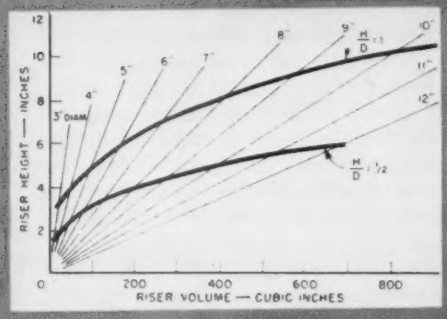

Fig. 4—Chart for the conversion of required riser volume to riser dimensions

Solidification times were determined for risers having diameters of 2½, 4½, 6½, and 8½ in., both where they were surrounded by sand and when exothermic sleeves of different wall thicknesses were applied. This was accomplished by inserting thermocouples into the geometric center of cylindrical castings. The cylinders had a height 1½ times their diameter, and 3-in.-thick exothermic pads were placed over each end to minimize end effects and approach the thermal conditions of a riser on an actual casting. Steel having a nominal analysis of 0.20 per cent C, 0.40 per cent Si and 0.60 per cent Mn was poured at 2900 to 2950° F.

TABLE I—Solidification Times of Exothermic Risers

Riser Diameter, in.	Riser Height, in.	Sleeve Wall Thickness, in.	Solidification Time, minutes
2½	3¾	0	3½
2½	3¾	½	11
2½	3¾	¾	14
2½	3¾	1	17½
2½	3¾	1¼	21
4½	6¾	0	18½
4½	6¾	½	35
4½	6¾	1	44
4½	6¾	1¾	63
4½	6¾	1¾	64
4½	6¾	2⅜	75½
4½	6¾	2⅜	71
6½	9¾	0	36
6½	9¾	¾	74
6½	9¾	1½	95
6½	9¾	2¼	108
6½	9¾	3	122
8½	12¾	0	56
8½	12¾	¾	89
8½	12¾	1¼	119
8½	12¾	2½	140

For example, a 7-in.-diam uninsulated riser is shown to have a solidification time of 42 minutes. The riser-sleeve combinations which also have solidification times of 42 minutes and could, therefore, replace the 7-in.-diam uninsulated riser, are as follows: 5-in.-diam riser, ½-in.-thick sleeve; 4-in.-diam riser, 1-in.-thick sleeve; 3½-in.-diam riser, 1½-in.-thick sleeve.

An attempt to determine the solidification time of a 12-in.-diam riser surrounded with sand was

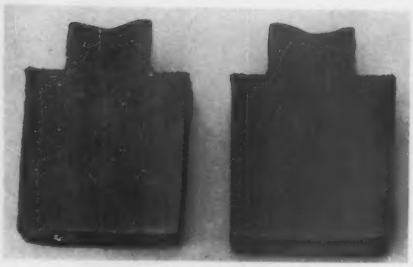

Fig. 5—Cube casting 4½ x 4½ x 4½ in. fed by riser 2½ in. in diam and 2 in. high with 1-in. exothermic sleeve

Fig. 6—Bar casting 3 x 3 x 11 in. Fed with a riser 2½ in. in diam and 2 in. high with 1-in. exothermic sleeve

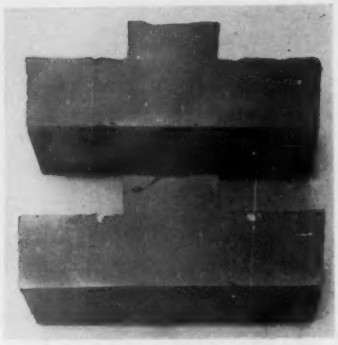

Fig. 7—Plate casting 7¼ x 7¼ x 1¾ in. Riser 2½ in. in diam and 2 in. high; 1-in. sleeve

unsuccessful because of mechanical failure of the thermocouple. The broken curve in Fig. 2 shows solidification times of uninsulated risers calculated according to the formula of Chvorinov.[3] For the four measurements actually made on the smaller risers, agreement with the calculated curve is quite close. Thus, it may be safely assumed that the theoretical curve can be employed to relate solidification times of the larger uninsulated risers to smaller riser-exothermic sleeve combinations in the manner described previously for the 7-in. riser.

Riser Volume Studies—Having established the diameter requirements of risers when moldable exothermic materials are employed, it was next necessary to determine how high these risers should be poured to contain the volume of metal required to feed the castings. Six castings having the dimensions shown in Table II were used in these tests. The castings were cube, plate, and bar shapes of two sizes. Dimensions of the larger shapes were twice those of the smaller shapes, which made their volumes eight times greater.

From the charts of Fig. 3 and 4, the dimensions of noninsulated risers needed to feed these castings were determined. The solid line of Fig. 3, which is the average curve obtained experimentally from approximately 100 test castings, shows that the volumes needed to feed the cube, bar, and plate shapes must be, respectively, 1.2, 0.6 and 0.4 times the casting volumes. The actual riser volumes needed are shown in column 5 of Table II. From Fig. 4, it is determined that these volumes can be supplied by risers of the dimensions shown in column 6 of the same table. Column 7 shows the sleeve thicknesses, as obtained from Fig. 2, which are required around 2½ and 5-in.-diam risers (selected arbitrarily) to match the solidification times of the corresponding uninsulated risers in column 6.

A 2½-in.-ID sleeve with a 1-in.-thick wall should be adequate to feed each of the smaller castings. Each of the three castings was poured with the riser sleeve filled to a height of 2 in., and 1 in. of mildly exothermic riser topping compound was added to each riser. The sectioned castings, Fig. 5 to 7, were completely free of shrinkage.

These tests were repeated but with the wall thickness of the sleeves reduced from 1 to ½ in. These castings, Fig. 8 to 10, were also sound, and the riser shrinkage indicated that a 2½-in.-ID, ½-in.-

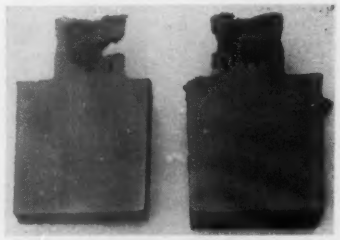

Fig. 8—Same casting as shown in Fig. 5, with riser of same size, but with ½-in. exothermic sleeve

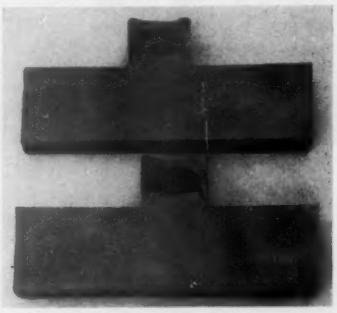

Fig. 9—Same casting as shown in Fig. 6, with riser of same size, but with ½-in. exothermic sleeve

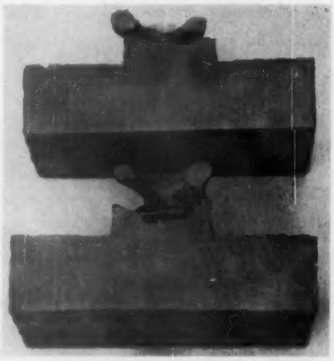

Fig. 10—same casting as shown in Fig. 7, with riser of same size, but with ½-in. exothermic sleeve

TABLE II—Calculations of Minimum Uninsulated Riser Dimensions Needed on Test Castings, and Exothermic Sleeve-Riser Diameter Combinations Which Can Replace Them

1 Casting Dimensions, in.	2 Casting Vol., Cu in.	3 L+W T	4 Vr/Ve from Fig. 3	5 Min. Riser Vol. in Sand, Cu in.	6 Min. Riser Dimension in Sand from Fig. 4		7 Exothermic Risers with Freezing Time Matching Those of Column 6 (From Fig. 2)	
					Diam, in.	Ht., in.	Diam, in.	Sleeve Thick. in.
4½ x 4½ x 4½	91	2	1.2	109	5	5½	2½	1
					5½	4½	2½	1⅛
3 x 3 x 11	99	4.7	0.6	60	4½	3¾	2½	¾
					5	3	2½	1
7¼ x 7¼ x 1¾	92	8.3	0.4	37	4	3	2½	½
					4½	2¼	2½	¾
9 x 9 x 9	730	2	1.2	876	10	11	5	2½ (est)
					11	9	5	...
6 x 6 x 22	790	4.7	0.6	475	8½	8½	5	1
					9	7½	5	1½
					10	6	5	2½
14½ x 14½ x 3½	735	8.3	0.4	294	8	6	5	1
					9	4½	5	1½

thick wall sleeve, filled to a height of 2 in., was just adequate to feed each of the three castings.

The thermal data in column 7, Table II, indicate that a 2½-in.-ID riser, with a ½-in.-thick insulating wall, should definitely feed the plate casting and, perhaps, the bar, but the cube casting should have contained shrinkage. The cube was sound, probably because its top corners were exposed to the molding sand when the smaller exothermic riser was used, whereas in conventional sand practice a 5-in.-diam riser would be required, which would essentially cover the entire top of the casting. By thus exposing the top corners of the cube, more effective surface area is available for dissipation of its heat to the mold and acceleration of its solidification rate. The cube, in freezing earlier, can then be fed with a riser having a proportionately shorter freezing time.

Using the results obtained in the series of smaller castings as a guide, each of the larger castings was made with a sleeve of 5-in.-ID and 1½-in.-thick wall, filled to a height of 4 in., and a 2-in. layer of mildly exothermic riser compound was added to the top of each riser.

These castings are shown in Fig. 11 to 16. Although the risers were filled to a height of 4 in., the riser stub remaining after solidification was only about 2 in. high—indicating that the entire riser remained molten during the early stages of feeding; after solidification started in the riser more

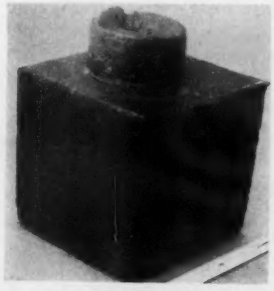

Fig. 11—Cube casting 9 x 9 x 9 in. fed by riser 5 in. in diam and 4 in. high with 1½-in. exothermic sleeve

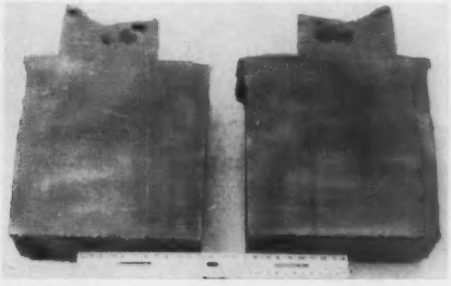

Fig. 12—Casting in Fig. 11 after it has been sectioned

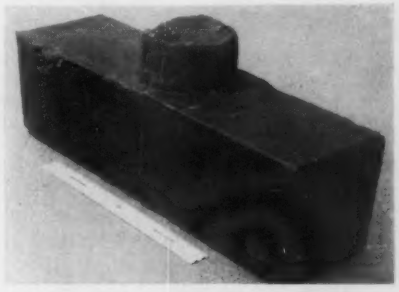

Fig. 13—Bar casting 6 x 6 x 22 in. fed by riser 5 in. in diam and 4 in. high with 1½-in. exothermic sleeve

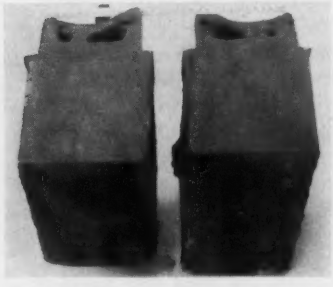

Fig. 14—Casting in Fig. 13 after it has been sectioned

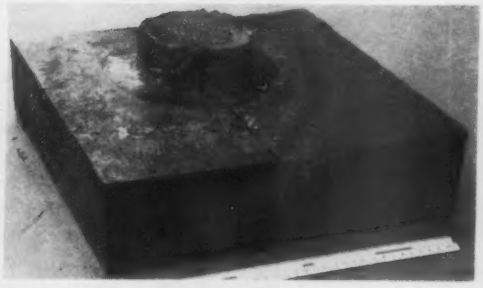

Fig. 15—Casting 14½ x 14½ x 3½ in. Fed by a riser 5 in. in diam and 4 in. high; 1½-in. exothermic sleeve

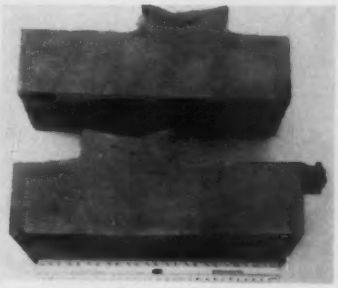

Fig. 16—Casting in Fig. 15 after it has been sectioned

Fig. 17—Casting 14½ x 14½ x 3½ in. Fed by a riser 5 in. in diam and 5 in. high; 1-in. exothermic sleeve

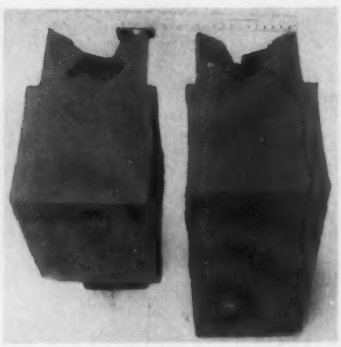

Fig. 18—Bar casting 6 x 6 x 22 in. Fed by a riser 5 in. in diam and 5 in. high; 1-in. exothermic sleeve

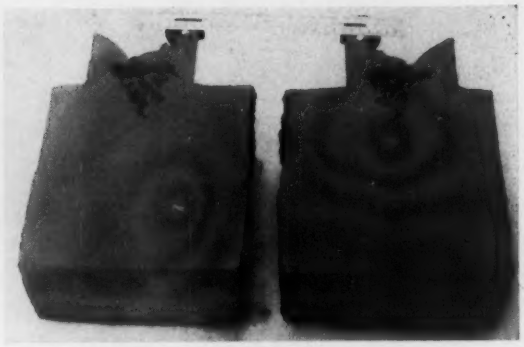

Fig. 19—Cube casting 9 x 9 x 9 in. Fed by riser 5 in. in diam and 5 in high with 1-in. exothermic sleeve

shrinkage occurred to complete the feeding of the casting. These castings were completely sound and the proximity of the pipe to the casting indicated that, with this combination of riser diameter and sleeve thickness, a 4-in. riser height results in maximum casting yield.

Second Series—The series of large castings was made a second time, using riser sleeves having a 5-in.-ID with a 1-in.-thick wall and filled to a height of 5 in. Thus, the riser was 1 in. higher and the insulation wall ½ in. thinner than for the first series. This riser was adequate to feed the plate and bar castings, Fig. 17-18, but not the cube, Fig. 19, which contained shrinkage. The efficiency of the exothermic materials is not as great on the large castings as on the smaller ones, which were all fed completely with 2½-in. diam, 2-in.-high risers insulated with ½-in.-thick walls. If this effectiveness of the exothermic materials were maintained with the larger shapes, 5-in.-diam, 4-in.-high risers insulated with 1-in.-thick walls would have been sufficient to feed each of the larger castings.

The diminishing insulation effect of exothermic materials with increasing riser diameters is predicted by the thermal data, as illustrated in Fig. 20. In this figure, the sleeve volumes for the various riser sizes are expressed as fractions of riser volume and the slanting lines connect points where solidification times are increased by factors of 2, 3, and 4 over those for uninsulated risers of the same diameters. It is evident that as riser diameters increase, the relative amount of exothermic material needed to bring about comparable increases in solidification time becomes greater.

From data obtained from the experimental castings the calculations shown in Table III were made which permits the chart of Fig. 2 to be expanded, as shown in Fig. 21, to provide for the minimum volume requirements of risers. The broken curves indicate riser-sleeve combinations where the riser volumes, as poured, should be 0.11 and 0.13 times the casting volume. The necessary volumes are controlled by varying the fill-height of the riser. Fig. 4 can be employed to determine the riser height for any given riser diameter and volume.

Thus, using again the example of the 7-in. riser in connection with Fig. 21, if a 3½-in.-ID, 1½-in.-thick wall sleeve were used to replace the 7-in.-diam uninsulated riser, the exothermic riser volume need not be over 0.11 times the casting volume since the point for this riser falls to the left of the curve for Vr/Vc ratios of 0.11. For the 4-in.-ID, 1-in.-thick wall sleeve the riser volume should be about 0.12 times the casting volume since this point falls about midway between the two Vr/Vc curves. The 5-in.-ID, ½-in.-thick wall sleeve should contain a volume in excess of 0.13 times the casting volume since the point falls to the right of the curve for Vr/Vc ratios of 0.13.

Much more experimental data are needed to complete this feature of the chart. When this is done a family of more or less parallel Vr/Vc curves representing decreasing riser efficiencies would be established for cases where ratios of sleeve thickness to riser diameter are decreased. It should be realized that when Vr/Vc ratios of 0.11 to 0.13 are employed, casting yields (neglecting the gating system) in the neighborhood of 95 per cent may be obtained.

Column 7 of Table III shows that when riser-

TABLE III—Calculations For Exothermic Riser Volumes and Comparison With Uninsulated New Volumes

1	2	3			4	5	6	7
Casting Dimensions, in.	Casting Vol., Cu in.	Exothermic Riser Dimension, in.			Exothermic Riser Vol., Cu in.	Vr/Ve Col. 4/Col. 2	Min. Non-Insulated Riser Vol., Cu in.	Col. 4 as % of Col. 6
		Diam	Ht.	Sleeve Thick.				
4½ x 4½ x 4½	91	2½	2	½	9.8	0.108	109	9
3 x 3 x 11	99	2½	2	½	9.8	0.10	60	16
7¼ x 7¼ x 1¾	92	2½	2	½	9.8	0.107	37	26
9 x 9 x 9	730	5	4	1½	78.5	0.108	876	9
6 x 6 x 22	790	5	4	1½	78.5	0.10	475	16
		5	5	1	98.0	0.124		21
14½ x 14½ x 3½	735	5	4	1½	78.5	0.107	294	26
		5	5	1	98.0	0.133		33

sleeve thickness combinations are employed which permit Vr/Vc ratios of 0.11, the riser volumes needed for the cube, bar, and plate are, respectively, about 9, 16, and 26 per cent of those of the minimum uninsulated risers needed on these shapes. These metal savings become less, of course, as the amount of insulating material used is decreased.

As mentioned earlier, the chart presented in Fig. 21 is incomplete because sufficient data on minimum riser volume requirements have not yet been obtained. For the time being, however, a rule of thumb can be suggested to determine height of exothermic risers; it will not lead to actual minimum riser volume needed, as would be directly indicated by the chart, but is safe. This rule is that the height of a riser be made of the same dimension as its diameter (h/D = 1/1).

Feeding Range of Exothermic Risers—Several 2-in.-thick plate castings were made to determine feeding range of exothermic risers. These castings were examined for shrinkage by transverse x-rays of ½-in. strips removed from the center of the plates. It was found that the feeding range of an exothermic riser was increased only by the difference in radius between it and the uninsulated riser which it replaced. This is not unexpected since the same thermal conditions prevail for each case. Thus, when a ¾-in.-thick sleeve was used around a 3-in. riser, its feeding range was increased by only 1 in. because it is then equivalent to a 5-in.-diam uninsulated riser.

The feeding range of a riser could be increased appreciably only if the riser were made to develop a much higher temperature than would ordinarily prevail, as is the case when highly exothermic, metal producing compounds are used. Such materials cause the riser temperature to rise to about 4000° F. The moldable exothermic materials do not increase the temperature of the riser metal, but only serve as effective insulation so that the riser temperature is maintained for long periods of time.

Economic Considerations—It has been shown that the efficiency of moldable exothermic materials decreases as the diameter of the riser to which they are applied increases. The efficiency of a unit volume of exothermic material also decreases as the sleeve thickness is increased, and, for a given riser diameter it is greatest with thin sleeves. This is clearly indicated by the decreasing slope of the curves in Fig. 1. In choosing the most economical combination of riser diameter and sleeve thickness, the foundryman must balance factors such as melting and cleaning costs, as well as the type of alloy involved, against the cost of the exothermic sleeves. If high-alloy steels are being cast where alloy losses on remelting foundry returns are high, it probably would be more economical to obtain maximum casting yields by using small risers and thick sleeves.

There is undoubtedly a critical riser diameter beyond which it becomes more economical to use the highly exothermic, metal-producing riser compounds rather than exothermic sleeves. For greatest feeding efficiency, risers need thermal assistance not immediately after pouring but at some time after they have been poured when they become mushy and flow of feed metal is difficult. The moldable exothermics react as soon as the metal contacts them, and on large risers the heat of reaction may be largely dissipated by the time the riser metal reaches this critical period. The exothermic, metal-producing compounds, on the other hand, are not applied to the riser until the riser is in its late stage of solidification, when the added heat can be utilized to the greatest advantage.

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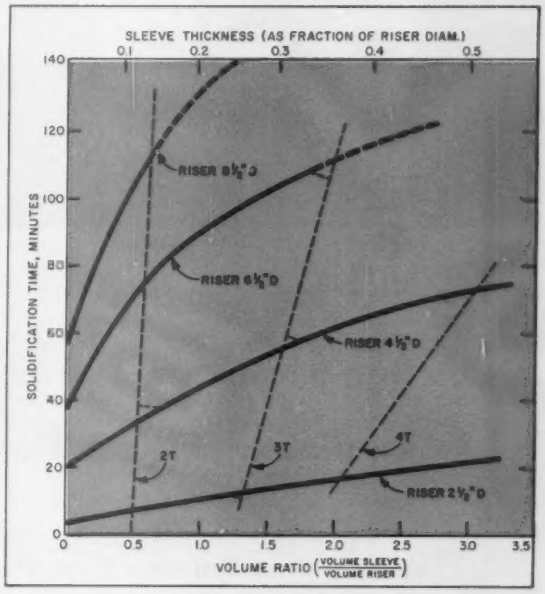

Fig. 20—Comparison of effectiveness of moldable exothermic material for risers of increasing diam

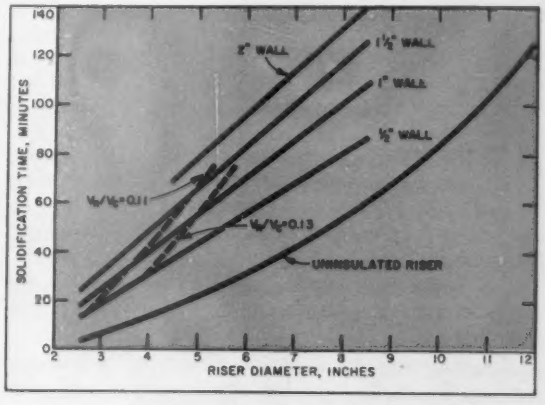

Fig. 21—Chart for the determination of riser diameter, exothermic wall thickness, and riser volumes required to replace uninsulated risers

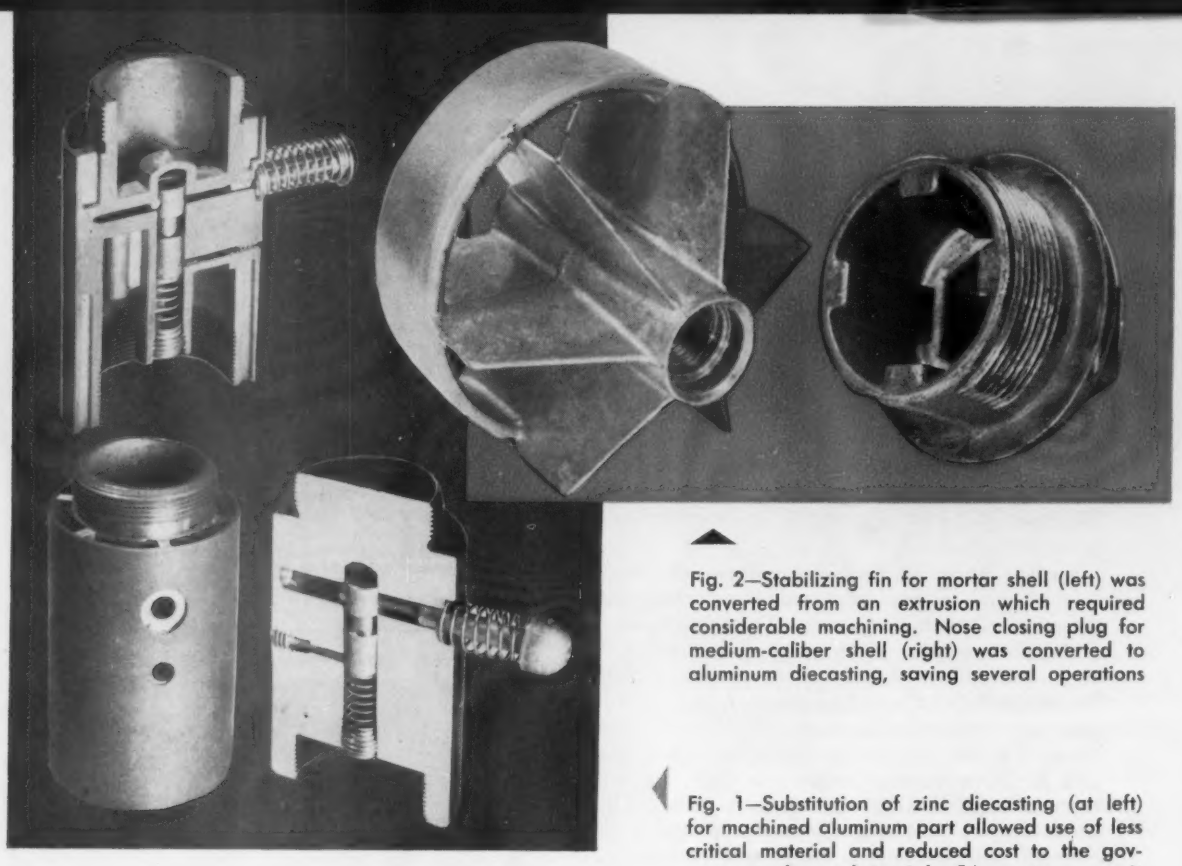

Fig. 2—Stabilizing fin for mortar shell (left) was converted from an extrusion which required considerable machining. Nose closing plug for medium-caliber shell (right) was converted to aluminum diecasting, saving several operations

Fig. 1—Substitution of zinc diecasting (at left) for machined aluminum part allowed use of less critical material and reduced cost to the government by substantial 54 cents a unit

DIECASTINGS

In Ammunition Design

Conversion of ammunition component parts to diecastings by the U. S. Army Ordnance Corps offers advantages, including conservation of critical materials and reduction of finishing costs

By LT. COL. L. G. KLINKER, MORRIS A. GARDEPE, and ROBERT H. RIDGWAY JR.
Ordnance Ammunition Command
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DIE CASTING is used extensively in fabricating ammunition component parts in a highly cost-conscious U. S. Army Ordnance Corps. Due to the nature of materials used and the chemical and physical properties obtained, the use of die casting is limited to small parts such as fuze bodies, shell windshields, booster cups, firing devices, and fuze lighters.

Research and development designs of such items are usually made from bar stock material and machined to size. In the time of national emergency, the supply of bar stock material becomes critically short, and the screw machine capacity is overloaded. To compensate for these conditions, many of the ammunition items have been redesigned during production engineering to use diecastings.

In the fabrication of the ammunition components, three basic die casting methods are always investigated by production engineers of the Ordnance Ammunition Command, Joliet, Ill., and its supporting engineering at Picatinny, Frankford, Lake City Arsenal and Diamond Ordnance Fuze Laboratories.

Zinc Most Widely Used—High-pressure zinc die casting is the most widely used method in the fabricating of ammunition component parts when small amounts of porosity can be tolerated. Ex-

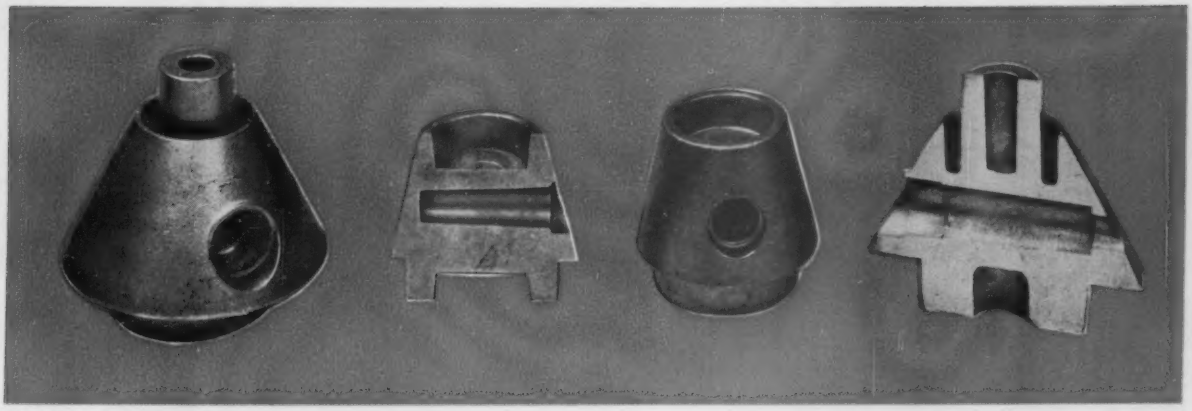

Fig. 3—Left to right, 4.2-in. M8 mortar shell fuze as cast; cross section, M52 mortar fuze; full view, M52 mortar fuze; cross section, M8 mortar shell fuze

perience with ammunition zinc diecastings which are made at high injection pressures has been that air may be trapped in the casting and produce minute pores or voids. Porosity is seldom, if ever, completely avoided although, as a rule, it can be confined to sections of the casting where its effects are of little or no significance.

In many cases, zinc-base diecastings can be used in place of more critical material such as primary aluminum or magnesium bar stock. Use of zinc-base diecastings conserves critical primary aluminum or magnesium bar stock and machine capacity such as automatic screw machines and forging presses, as well as extrusion and rolling capacity of tube and bar production facilities. Such castings are specified under zinc-base alloy discasting Specification QQ-Z-363.

An example of zinc diecasting substitution for a machined aluminum part is illustrated by the 3.5-in. rocket fuze, practice. This substitution allowed the use of a less critical material and gave a substantial cost reduction to the government of 54 cents per unit (Fig. 1).

Aluminum Diecastings—Ability to cast ammunition parts in accurate, thin sections, the uniformity of reproduction plus low cost per piece, explain why aluminum diecastings are always considered. Experience has been that tolerances as low as 0.002 in. per linear inch, but not less than 0.0015 per inch on any dimension, can be maintained. The dimensional accuracy, smooth surfaces, and ability to cast threads and core holes also make for minimum finishing costs.

Substantial savings have been realized in metal costs due to the lighter unit weights permitted by the thinner section. Fuze bodies and shell windshields are examples of aluminum diecastings used in ammunition design. The aluminum alloys used in ammunition die casting are usually required to meet Specification QQ-A-591a. Where possible, however, diecasting alloys containing regulated amounts of several elements are used. This allows for more extensive use of secondary aluminum alloys and more freedom of allocation for primary aluminum stock in time of emergency.

The nose closing plug for medium caliber shell (Fig. 2) was formerly cast from gray iron. By substituting an aluminum diecasting, the necessity of a protective finish as well as the machining of the seating face and the thread chasing were eliminated.

The stabilizing fin for the 81-mm mortar shell (Fig. 2) is now being die cast from aluminum. The previous method of manufacture utilized an extrusion which required considerable machining, a tube which required considerable machining, and a brazing operation. Currently the fin is die cast in one piece and only the internal threads are machined.

Permanent Molding—The permanent mold process applied to Specification QQ-A-596a for fabrication of high-strength castings, as developed during the last ten years, is used to produce some types of ammunition castings. Ordnance production engineers like them because of demonstrated pressure tightness, superior surface finish, close dimensional tolerances, speed of production and cost per piece. They have been used successfully to fabricate fuze bodies for mortar ammunition (Fig. 3) where the superior qualities noted above are most essential, and eliminated the need to machine such parts from bar stock. Pressure tightness in the critical areas where the explosive safety of the item was involved primarily dictated the selection of the permanent mold process as the principal method of manufacture for this item. The high casting efficiency also reduced inspection costs to a significant degree.

Ammunition permanent mold castings are of the type made in permanent metal molds usually produced from alloy cast iron. Automation of a specific permanent mold casting technique through the use of continuous operating melt furnaces and turntables on which from ten to fifty permanent molds are mounted is one innovation that U. S. Army Ordnance approval of such castings helped to bring about. The molds, mounted on the turntable, pass under the ladle of the furnace and are filled automatically. Two to three men can control this type of operation.

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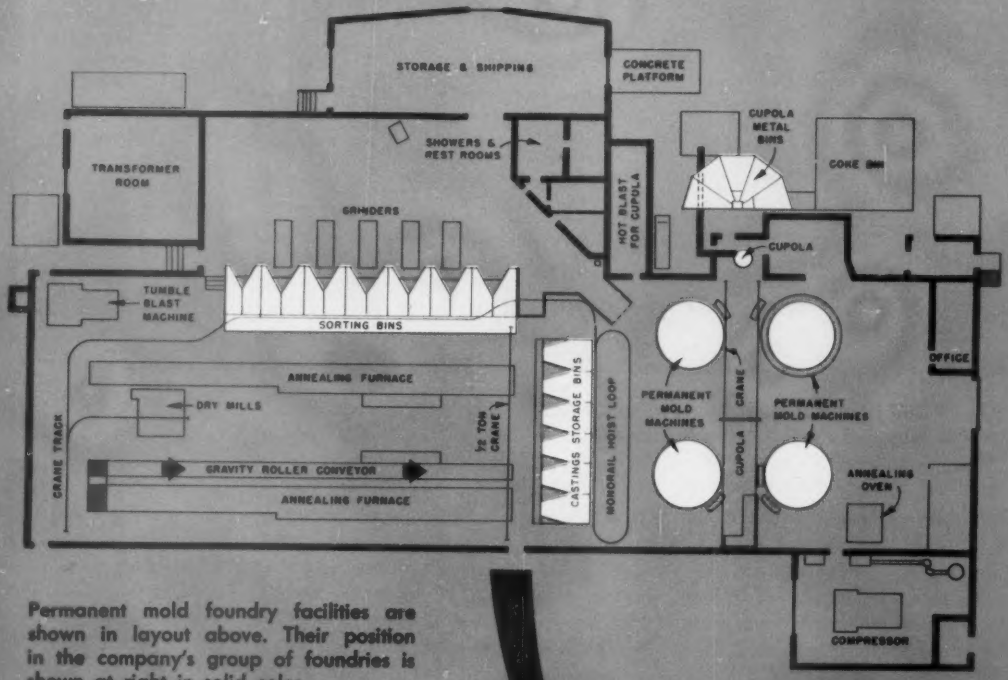
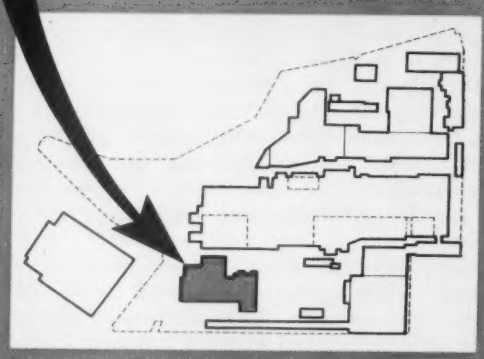


Permanent mold foundry facilities are shown in layout above. Their position in the company's group of foundries is shown at right in solid color



Foundry Modernization

(PART III)

General Electric Co.'s permanent mold production of gray iron castings and the neutral-lined cupola, patternshop, and quality control operations are described in this concluding article of a series

By ROBERT H. HERRMANN
Associate Editor

Pouring and removing castings from a rotary permanent mold machine

GENERAL ELECTRIC CO.'s permanent mold foundry at Elmira, N. Y., is equipped with four rotary machines, each having 12 permanent molds for producing gray iron castings. Machines operate on a cycle of three to six minutes depending on the size of casting being produced. Interchangeable molds used on these machines are made in four sizes, the largest being 18 x 18 in. One multiple-cavity mold is capable of producing 400 to 500 castings per hour. Temperature of the molds is kept at about 527° F during the molding operation.

Operating Cycle—The cycle of operations begins with an operator cleaning the molds with a jet of air. Then sand cores, if required, are set and the mold passes through a reducing acetylene flame which coats it with carbon. The mold is then closed by an air cylinder and poured with a hand ladle.

Air cylinders reopen the molds in front of a cooling fan and operators remove castings from the molds with tongs and toss them into tote boxes.

The boxes are lifted by a monorail hoist and the castings are dumped into bins with sloping bottoms. Castings slide out of openings in the front of the bins to shelves along which operators knock off the gating metal and sort the castings into batches. All castings then are loaded into trays for annealing at 1650° F in a continuous oven. Castings are in the heat zone for 1½ hr and then cool for 1½ hr. As they emerge from the oven they are unloaded into boxes and moved by an electrically-driven monorail hoist to a tumble-blast cleaning machine loaded by skip hoist.

From the tumbling machine they are unloaded into tilting buckets carried by an electrically-driven monorail hoist and dumped into sloping bottom bins which supply six double-end stand grinders. Ground

All patterns used in the Elmira foundries are made in the company's well-equipped shop

castings are tossed onto tables where they are inspected and sorted into shipping boxes.

Melt in Neutral-Lined Cupola—Metal for the permanent mold foundry is supplied by a hot-blast, water-cooled, neutral-lined cupola. It is tapped continuously into a forehearth from which a bull ladle on a bridge crane receives metal for movement to the four permanent mold machines. The cupola also is a front-slagging unit in which molten slag discharges into a water sluice which carries it out into the yard.

Raw materials for the cupola are unloaded from gondola cars by a bridge crane, which also segregates the material into sloping bottom hoppers converging over the charge bucket on a skip hoist charger. In the lowered position, the bucket rests on a scale, and an operator rakes the materials from the various hoppers into the bucket. The weight of each charge component is indicated on the dial of a scale in front of the operator.

The 500-lb metal charges consist of 25 per cent returns, 30 per cent pig iron, and 45 per cent purchased iron scrap. The coke charge is 85 lb and limestone is 20 lb. Metal analysis is 3.55 C, 2.50 Si, 0.08 S max, 0.70-1.00 Mn, and 0.30 P max. Tensile strengths of the iron vary from 20,000 to 60,000 psi, depending on section size of the casting.

Permanent molds used in the foundry are cast in dry oil-sand molds and machined in the foundry's own machine shop.

All patterns and coreboxes used at the Elmira foundries are made in a modern, well-equipped metal and wood pattern shop. Aluminum, bronze, and gray iron are used for metal patterns. Those of gray iron are cast in the Elmira foundries; nonferrous equipment is cast by outside foundries to GE specifications. All equipment, however, is machined and finished in GE's shop. Wooden patterns and coreboxes are of mahogany, cherry, or pine.

Patterns and coreboxes range in size from a few inches to 6 ft in diameter. Depending on customer requirements, molding methods, and other factors, patterns are made as loose pieces, cope and drag, matchboard, or matchplate units.

Approximately 22,000 patterns are stored in a 120,000-sq-ft area at the foundry so that they are available for immediate production use.

Quality Control—A completely equipped laboratory is available for testing incoming materials, metal samples, finished castings, and sand samples. Tests also are conducted on developmental projects such as new processes and new or redesigned castings.

Process metallurgists, in co-operation with manufacturing men, develop cupola charge compositions to produce metal of a desired analysis, and core and molding sand mixes.

Throughout each day's operation metal samples are checked for composition, hardness, tensile strength, transverse strength, and microstructure. Sand mixes are tested at room and elevated temperatures. Data are recorded and charted to serve as a guide for control procedures.

A final check on quality is made by visual inspection of all castings. X-ray and magnetic particle inspection equipment also is used for inspection as well as aids to the development of proper casting designs.

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Checking casting dimensions against a drawing is part of GE's control program

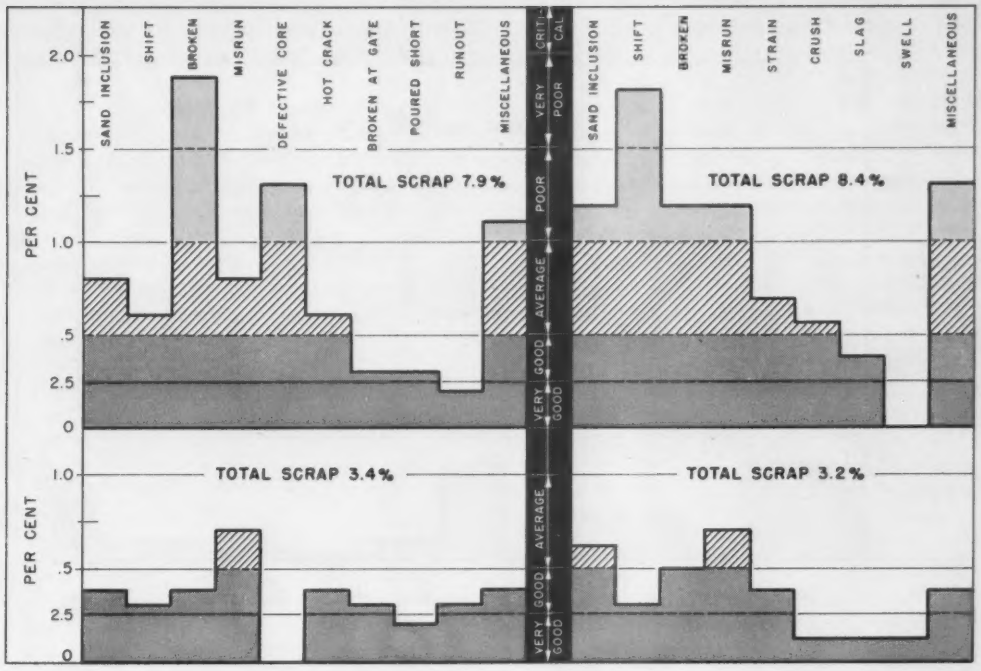


Fig. 1—Upper charts show breakdown of defects for two foundries when control system started. Results several months later are shown below

Cutting Costs Through

QUALITY CONTROL

The author describes cost-saving advantages in a control program which measures statistically the influence of each sort of casting defect on the average of all jobs of a given type

By KENNETH M. SMITH
Foundry Consultant, Chicago

POSSIBLY the only point common to all types of quality control programs is the belief they must be built around scrap reduction. A basic formula for scrap reduction can be expressed as follows: Let A stand for good castings, B for foundry scrap, and X the limit below which further reduction in scrap becomes too costly. It is therefore a function of quality control—expressed as A + (B − X) — to reduce foundry scrap until B equals X.

If we are successful in meeting our objective, quality control would equal A + X or good castings plus an economic allowance for scrap. By substituting monthly percentage figures, the formula covers all castings produced and evaluates any given performance satisfactorily.

The formula is now being applied to each type of casting defect in foundries using the Average Job Quality Control System. This system, described in FOUNDRY, March, 1957, measures statistically the influence of each type of defect on the average of all jobs in a given type of work.

Where It Begins and Ends—On an arbitrary basis, augmented by considerable data from 30 foundries, the following figures seem to approximate the true status of each defect. This experience tells us that quality control begins at 98.0 + (2.0 − 0.25) and ends at 99.75 + (0.25 − 0.25) — or when B = X. These figures mean that quality control operates when 98 to 99.75 per cent of all castings made are good ones and when each defect is between 2.0 and 0.25 per cent.

It has been found that when each defect meets the end requirement of 0.25 per cent, the total scrap figure will not exceed 2.5 per cent; a combina-

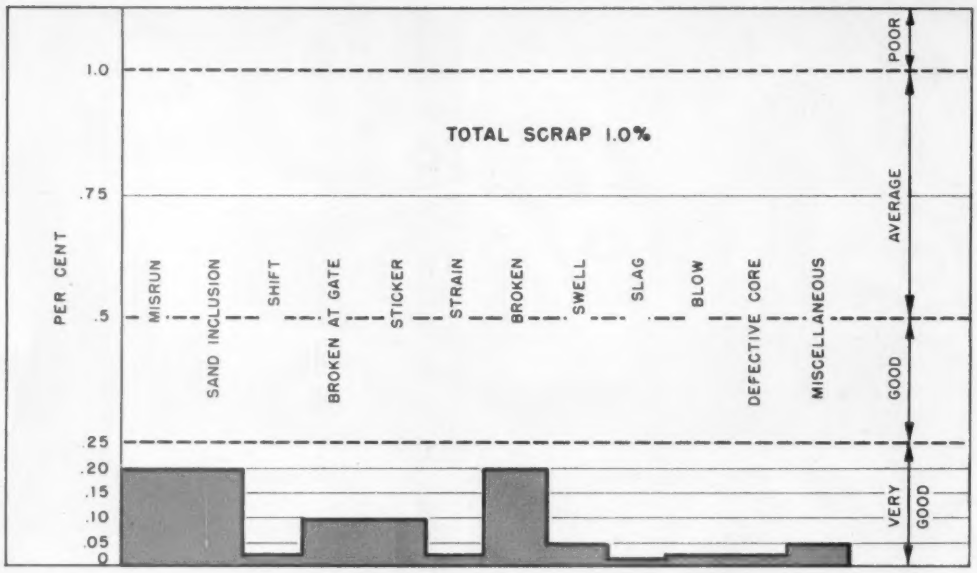


Fig. 2—With scrap reduced to a 1 per cent total, future emphasis for this operation will be on control of individual jobs

tion of defects between the minimum and maximum figures, however, can and often does exceed 10 per cent. Within these fairly narrow boundaries of quality control, performance varies from very poor to very good. In our setting up a scale for measuring any performance within the range, the following breakdown has been accepted by those who have been asked to live by it: Very good, 0 to 0.25; good, 0.25 to 0.5; average, 0.5 to 1.0; poor, 1.0 to 1.5; very poor, 1.5 to 2.0; critical, 2.0 and up.

It will be noted that to improve a casting defect percentage from 2.0 to 0.25 calls for an 87.5 per cent reduction in amount of scrap. At first glance, a reduction of this size appears impossible to many foundrymen. Actually, it means increasing the number of good castings produced per hundred from 98 to an average of only 99.75, and this accomplishment is more readily accepted as possible.

Totals Can Mislead—Total scrap figures also can be misleading because they merely reflect the overall performance of all casting defects. Our prime consideration should be the progress of each defect. For example, A and B foundries produce identical types of castings and on one occasion they compared their respective scrap figures. When the totals were found to be approximately the same, the subject was dropped. The fact is that in almost any two foundries the total scrap is the result of widely different percentages for the various individual defects, and each foundry will benefit by adopting the better processes of the other. Failure of foundrymen to take advantage of such opportunities is part of the price paid for attaching excessive importance to the performance of individual jobs.

For generations we have generally confined our interest to one job at a time, making only a token attempt to correlate the problems of the one with those of the whole. If a certain job consistently gives trouble, it is an indication that certain foundry processes have not been set up with that job in mind. This is what we mean when we talk about process limitations, and it is the key to many process improvement considerations. The only time when individual jobs become all important is when process capability is near the economic limit. At all other times, management and supervisory personnel should concentrate on process improvement work first and individual job performance second.

The upper charts of Fig. 1 show the breakdown of casting defects for two foundries at the time they installed the Average Job System. The data are from the performances of the preceding 25 days. Two different types of work are represented, and all jobs in each type are included.

Results from the same operations several months later are shown in the lower charts of Fig. 1. Roughly 80 per cent of the reductions resulted from process improvement, the balance from work on individual jobs. Duplication of these performances in foundry after foundry leads to the conviction that each casting defect can and should be below 0.5 per cent, regardless of cause or the current figure.

One foundry, starting originally with a total scrap of 9 per cent, recently had a record of individual defects shown in Fig. 2 and a total of 1 per cent scrap. In this case, process work has been completed, and future emphasis will be on control of individual jobs in order to continue the same level of performance.

Start with Process Improvement—Confusion has existed in the past over the relative merits of control activities vs process improvement work. Process improvement is the big factor while we reduce a casting defect from 2 to 0.5 per cent. Below 0.5 per cent, we encounter rapidly diminishing returns from process work; here we must recognize that only control can consolidate the gains into long-term

benefits. To take full advantage of both types of scrap reduction at any stage of the downward trend, it is imperative to know the difference between the two.

To analyze the average job picture properly requires considerable practice. In the examples illustrated in Fig. 3, 4, and 5, lack of control is indicated by the encircled points above the upper control limit (U.C.L.). Process capability is evaluated by the average of points below the U.C.L. In each case the average shown is a standard average (X′) based on the best monthly performance to date. Fig. 3 indicates bad control of an excellent process. Fig. 4 represents perfect control of a very poor process.

Fig. 5 challenges analysis. It should indicate that the average job is consistently out of control, but careful thought leads to a different approach. Previous history of this operation showed that the average line (0.5 per cent) was established during a period when control was very good, and one of two circumstances probably has caused the subsequent poor performance. One possibility is that an adverse change in the process occurred unnoticed. A second possibility is that composition of the average job now contains a larger share than formerly of the more difficult jobs. In this case new process requirements are called for.

From the start of a scrap reduction program until the ultimate goal is reached, proper analysis of quality problems depends on the relative importance attached to four basic considerations. During the high-scrap period, the order of importance is 1) long-term trend of total scrap, 2) long-term trend of each major defect, 3) process capability and process stability, and 4) control (individual job performance).

The Fourth Variable—It is fairly simple to interpret statistical charts when a single job is involved, but rarely, if ever, in a jobbing foundry operation do we establish a network of processes for the benefit of only a single job. In a multiple job system we have the variables of not only the man, material, and machine, but also the fourth variable of the difference between jobs. Next, because the processes are not designed for any particular job, we must devise some new means for meas uring both control and process capability. Hence the procedure termed the Average Job System.

Since the average job represents each pattern in production, it is possible to compare all jobs against the same standard. Control of the average job guarantees that total scrap figures cannot increase. Of major importance is the fact that the average job picture is the only satisfactory means for measuring process capability in jobbing operations. Moreover, the average job provides statistical quality control with minimum cost, personnel, and paperwork. The only essential difference between single and average job performance is that the latter requires considerably more imagination and understanding for proper analysis.

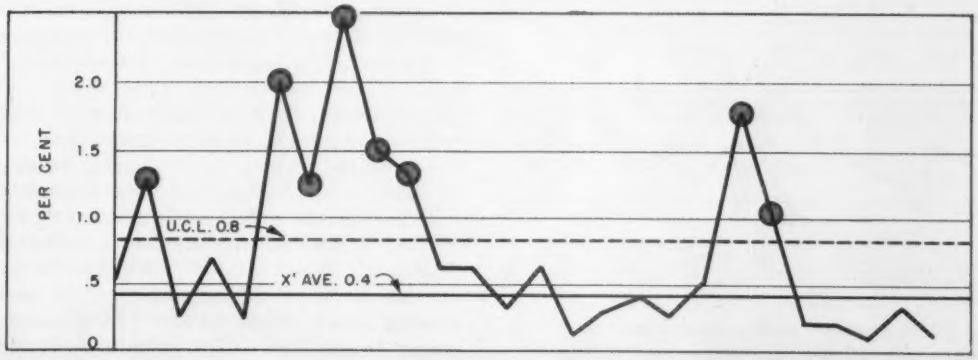
Control of the average job recognizes three distinct job types in each defect—the simple, the complex, and the average. From the control standpoint, the average job is benefited most by changing the complex job sufficiently to fit existing processes.

How do we arrive at a satisfactory group of processes for the average job? Let's consider a case in which the average job has performed month after month with critical amounts (over 2 per cent) in a certain defect. Obviously, the major reduction in this level would result from process improvement based on the complex job requirements. This should be done, if not too expensive. Usually, however, we must settle for process improvement based on requirements of a job between the most complex and the average. The same improved process then is applied to all jobs. In solving process requirements for a guinea-pig job, it is helpful to use a solo statistical chart for the duration of the investigation.

After a few experiences with process improvement we realize that the better performances of a foundry process have been limited to the relatively simple job and that the wide gap separating them from the complex job performance has been mostly a process of process limitations. This historical gap can and must be closed, or quality control has no meaning.

There's a Difference—Remember these differences between control and process work. The purpose of control is to maintain the average during a period of normal fluctuation and to reduce the average somewhat during periods when a few of the fluctuations are known to be abnormal. The purpose of

Fig. 3—Indication of bad control over an excellent process. Encircled points are above the upper control limit



process improvement is to reduce the average through elimination of a portion of the normal fluctuations. In the Average Job System, control work improves the performance of one job at a time, whereas process work improves the performances of a number of jobs at once, the most complex jobs more than others.

Errors in analysis of the average job performance are most likely to be made in process capability and stability. Fig. 6 shows that process capability to avoid the misrun defect was greatest in June (0.4 per cent). In subsequent months, capability deviated considerably from this figure, accompanied by lack of control. Analysis shows that while capability is satisfactory to include the majority of patterns, stability is absent whenever the proportion of difficult jobs exceeds that of June. In this instance, process improvement ignored the complex job requirements.

The remarkable stability shown in Fig. 7 and 8 is possible only when the gap between simple and complex job performance is fairly narrow. Fig. 7 indicates a process level of about 1.9 per cent, or very poor when measured against the evaluation scale. Process improvement could change it to the type of chart shown in Fig. 8.

To sum up the analysis of Fig. 3 through 8, the following relationships should be recognized. The daily trend of Fig. 3 leads to the monthly trend of Fig. 6. From Fig. 4 we should expect the consistently poor results shown in Fig. 7; and in Fig. 5 we apparently have lost the integral part of our process and had better identify the cause promptly. Finally, the only sure road to the level of Fig. 8 is through a monthly picture combining the excellent control of Fig. 4, with the process gradually improved to the standard average line of Fig. 3.

Only after we have acquired practice in analyzing the average job picture correctly can we apply the knowledge successfully. It is a real challenge to our powers of observation to detect weaknesses in both control and process with a parade of good castings passing constantly before our eyes. Usually we are searching out the small differences rather than the large ones. In process improvement work we often must incorporate changes never attempted before in our particular foundry.

What To Correct—We have found that the average job responds more favorably to certain types of corrective action than to others. Some of the most successful of these actions are listed here, covering eight casting defects in all. Four of them may be classified as major defects because they tend to repeat themselves frequently in numerous shops.

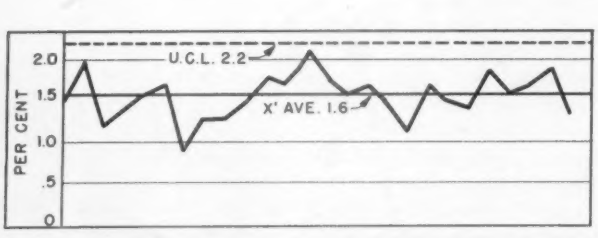


Fig. 4—Chart shows perfect control over poor process with 2.2 per cent upper control limit

MAJOR DEFECTS

Shifts—The desire of customers to approach shell molding joint alignment on green sand castings is one cause of an increase in shifts. To meet the challenge, we must reduce equipment variables to almost zero and control human variables to within a few thousandths of an inch.

In matchplate work, some shops are holding close shift tolerances and reproducing shift percentages well under 0.5 per cent. These shops maintain excellent control over the alignment and clearances of the easy-off and pop-off types of flask equipment used in conjunction with floppy jackets. In cope and drag tight flask production, the major cause of shifts is the forcing of distorted flask sections together or into position over patterns.

Broken and Cracked Castings—There are at least four main causes of broken or cracked castings:

1. Cleaning room bottlenecks.
2. Old-style conveyors with deep drops at transfer points. Much of this damage can be eliminated by the use of chutes designed to break the fall in half by reversing the flow direction in a bottom section.
3. Human variables. These can be minimized by setting up specific handling techniques for each type of casting and by enforcing their use.
4. Hot cracks, in which casting design is important. Many customers are stepping up their interest in design changes, but some foundrymen continue to withhold recommendations, apparently through fear of offending the customer.

Sand Inclusions—Sloppy molding still is the chief cause of sand inclusions, with a small percentage of the molders doing most of the damage. Here again, it is up to supervision to set the standard and to be sure that all molders live up to it.

There also is a strong tendency to classify several other types of defects as sand inclusions. Some of these errors in diagnosis are difficult to avoid, but can be detected for what they are through careful investigation. Inspection after grinding, for example, often destroys the evidence of a crush.

Scabs, cuts, and washes in the gating system are apt to be classified erroneously as sand inclusions, and the difficulty of identifying slag accurately also is a factor. Be sure to check for these errors in diagnosis before evaluting the causes of sand inclusions.

Misruns—This major defect is mentioned last because of the close tie-in between it and the minor defects, which will be discussed next. On squeezer work, to avoid such defects as strain, swell, and runout, a pourer tends to reduce pouring speed, and an increase in the misrun, shrink, and slag combination usually follows a low pouring temperature.

If we agree that misruns are the worst of these defects, we should do everything possible to eliminate compromises during pouring. All sprues and pouring basins should be kept full of metal at the proper temperature. This procedure also will help

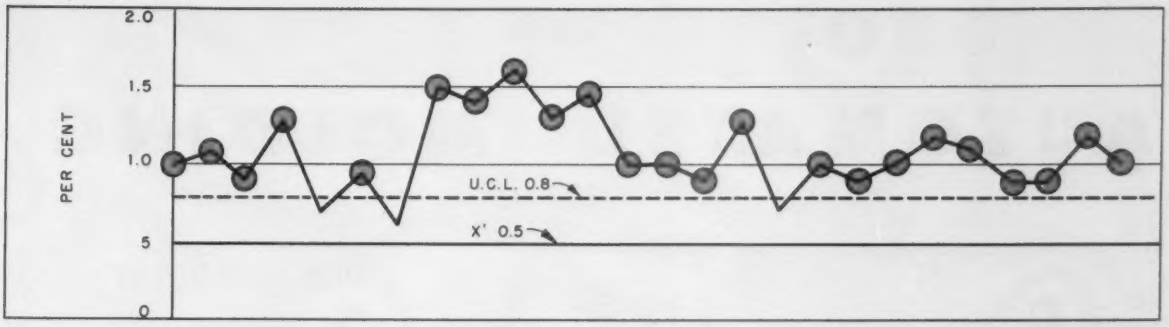


Fig. 5— Apparent indication that the average job consistently is out of control developed another answer on close analysis

to solve the secondary causes of misruns—faulty gating and fluidity problems.

MINOR DEFECTS

Strains—When we have eliminated the possibility of reducing pouring speeds as a cure for strains, swell, and runouts, we are ready to isolate the real causes of these minor defects. Horizontal strain fins on squeezer castings have a direct relationship to the pounds of weight applied and to the area of contact between the weight and the mold. Crooked weights and flat molds, or vice versa, reduce the contact area, and strains result. Insufficient weight or too quick a removal of weight has the same effect. Vertical fins are associated with ill-fitting jackets that reduce the support of the mold side walls.

Swells—Mold wall movement and high deformation cause far fewer swells than low mold hardness. In a desire to eliminate nonmechanical ramming and peening operations, foundrymen sometimes fail to compensate with controlled flowability, press board peen strips, and adequate jolt-squeeze ram time.

Crushes—Crushes can scrap as much as 5 per cent of medium-sized, heavily cored cope and drag work. If we include core shaves as part of the same problem, we find that the major causes involve core accuracy and deviation from level of the cope during closing. Shifted mold joints and bad clamping procedures also contribute substantially to occurrence of the defect.

Castings Broken at Gate—Mechanized handling of small castings aggravates the spruing problem when spruing is performed on a moving belt. Even when care has been taken to establish breakoff points consistent with proper feeding, it usually is necessary to sprue certain castings on the floor. This defect should not be included in the broken casting account unless the percentage involved is too small to warrant separate consideration.

This discussion of casting defects has not mentioned many other causes. Those reviewed illustrate the most common and easily detectable causes for process limitation. The same sort of investigation into other scrap causes will close the gap between improved process capability and the economic limit of process improvement.

In specifying that quality control begins at the 2 per cent figure, we are covering the maximum scrap per defect that would require the services of a system. The goal of the quality control scrap reduction program is reached when all defect percentages have become stabilized at the economic limit. From current performances in all defects, we now know that the economic limit is below 0.5 per cent, and there is mounting evidence that the true figure cannot be above 0.25 per cent.

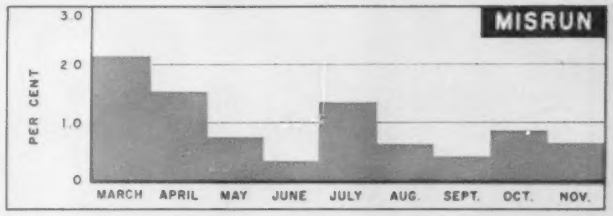


Fig. 6—Stability in misrun defects is lacking when proportion of difficult jobs exceeds that of June

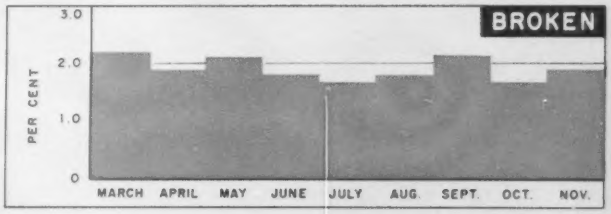


Fig. 7—Mixture of simple and complex jobs is steady but high defect level calls for process improvement

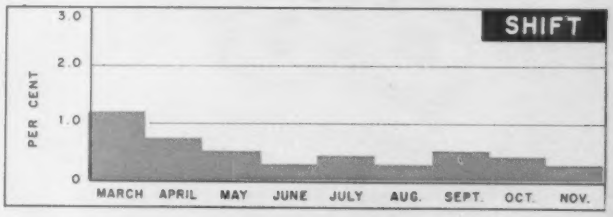
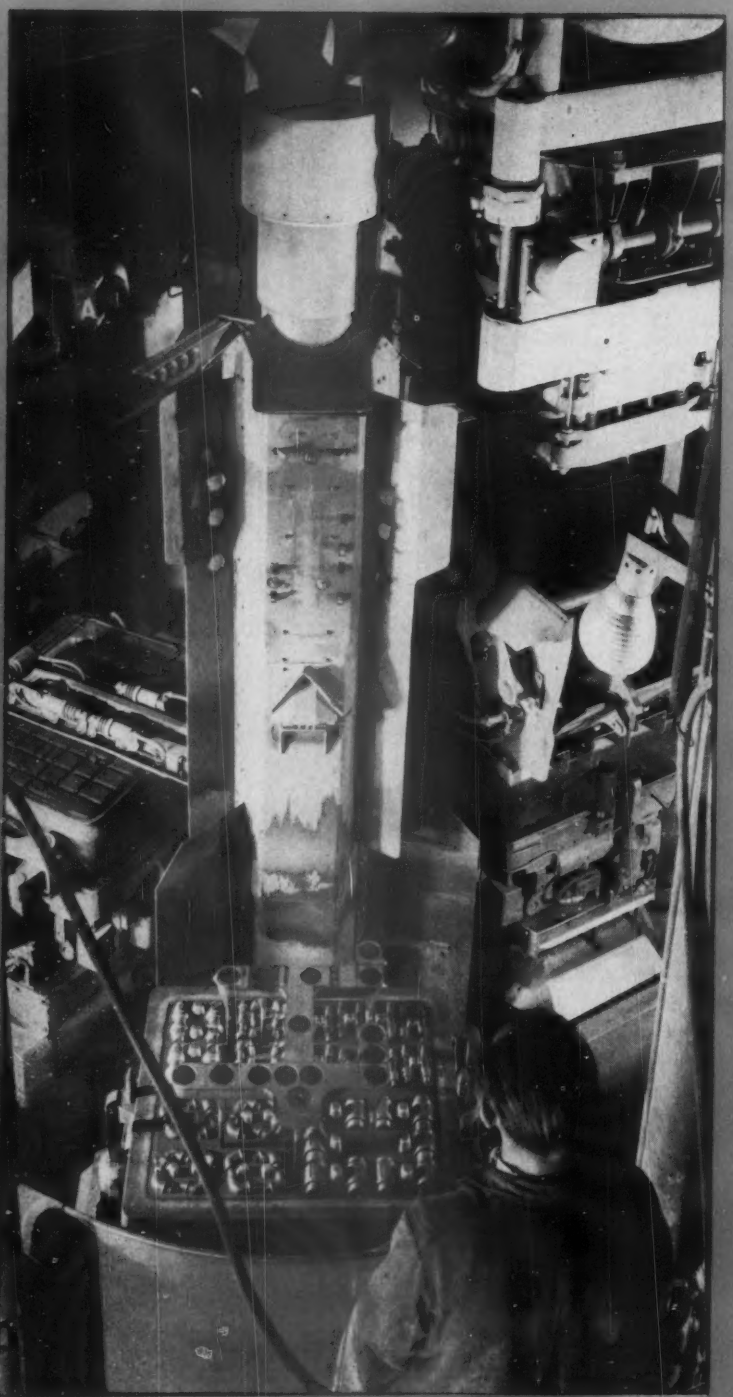


Fig. 8—Stability here is good and defect level low

AUTOMATED MOLDING

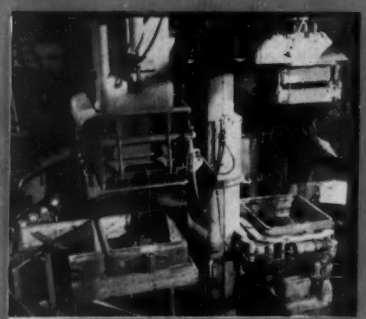


Designed for Production-Jobbing Foundry

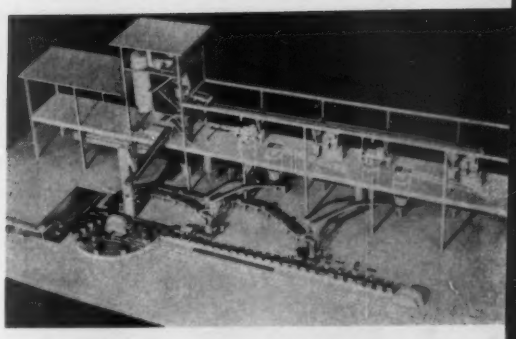
Automated installation at the George Fischer Ltd. malleable iron foundry in Switzerland makes, pours, and shakes out up to 300 22 x 27-in. molds 6 to 12 in. high per hour. It also mixes and cools the sand

Left—3-station cope unit. Operator's station in front, precompacting at right, and final compacting and stripping station at the left

Below—Facing sand is vibrated into empty flask. At left, the measuring hopper receives load of backing sand



and POURING



Model of three-station twin installation with sand handling plant

A NEW type of automated foundry system has been developed as the result of a change in the basic approach to automation of foundry operations. This approach involves two factors:

1. Design of equipment in the system was based on latest foundry technological developments, not simply as a solution to a material handling problem.

2. The system was designed for versatility and flexibility in regard both to production output per pattern and variations in casting size, shape, and weight. In this respect it differs from installations designed primarily as single-purpose lines for high production of such castings as motor blocks, heads, manifolds, tube fittings, etc.

The system was developed during the last six years by Edwin Buhrer, Swiss consulting engineer, and the engineering staffs of American Automation Corp., Ann Arbor, Mich., and George Fischer Ltd., Schaffhausen, Switzerland. A prototype installation has been in production for almost two years at the George Fischer malleable iron foundry in Schaffhausen. It includes twin three-station molding units.

Nine-Man Crew—The prototype installation is producing up to 300 22 x 27-in. molds per hour with a crew of nine men, exclusive of coresetters. Automated operations include molding of drag and cope molds; closing of molds; weighing down of molds; pouring; mold cooling; shakeout; bottom plate, cope, and drag flask separation and return; and sand feed and return, including cooling.

Flask height can be varied from 6 to 12 in., and a different flask height can be used at each of the three molding stations in the twin installation. Maximum casting production depends on average casting weight per mold. With two-shift operation and no allowance for downtime, this installation will produce a maximum of about 36,600 tons of castings per year with an average casting weight per mold of 60 lb. On this basis, for the direct operation, 1 manhour is required per ton of castings. Manhours per ton and annual production vary directly with average casting weight per mold. Mold production can be varied in small increments from the 300 per hour maximum to a minimum of 150 per hour. Pattern changes can be made in about 1 minute.

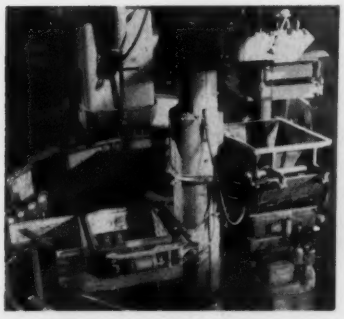
All program cycling devices operate on the mechanical-pneumatic principle, without electronic controls. A superimposed electrical system enhances the safety of the operation and indicates the location of any malfunction of major elements of the installation. These factors plus the interchangeability of major components and a program of preventive maintenance assure that downtime is kept at a minimum.

The molding and pouring area is approximately 53 x 208 ft, and a partial basement is included under this area. The sand handling plant is about 20 x 208 ft on each of two levels. Thus the total floor space required is 73 x 208 ft, or 15,184 sq ft.

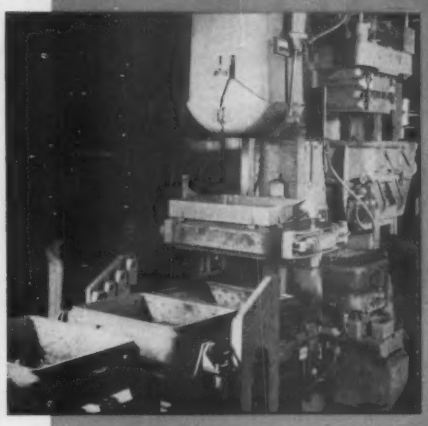
Uses Synthetic Sand—Synthetic sand is used primarily because of the low cost of the clay binder, only a small fraction of which burns out when molds are poured. Molds are precompacted by jolting, then jolted and squeezed for final compaction. A unique method is used to provide as uniformly hard molds as possible by automatic means.

Both facing and backup sand are employed because mechanical and thermal requirements of the sand at the mold-metal interface are substantially higher than those of the backup material. An even, loosely banked layer of facing sand is fed onto the patterns from small silos mounted on the molding machines. This sand reaches the silos through a riddle, and the silos are fitted with an open, grid-type bottom which can be oscillated vertically. It is the same size as the flask, and the amount of sand can be regulated by adjustment of the vibrating time. Both facing and backup sand are fed by conveyor belts from main storage bins below the sand mixing units.

A special measuring hopper delivers backup sand. The cross section of this hopper corresponds to the



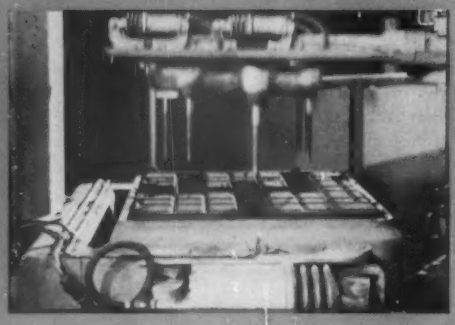
Measuring hopper swung into position on top of flask. Gripper arm at left is ready to pick up the empty flask



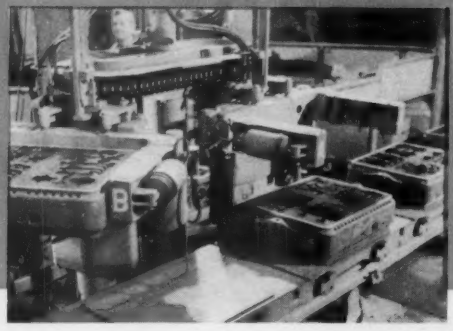
The flask entrance station

Operator's station. Visible are subdivided pattern plate held in place by the quick-change device and top runner pattern with five downgates

The finished mold travels through an arc of 180 degrees and is placed on the moving main conveyor



Withdrawing runner pattern from the cope mold



length and width of the flask, and its bottom is formed by two movable shearplates which incline slightly to the center when closed. A hopper is filled in such a fashion as to yield the best sand distribution with minimum compaction. It is mounted on a device which permits filling it in a position opposite the pattern plate.

Molding—The full hopper is swung over the pattern, set down on the flask, and held to it by a pneumatic clamping device. The shearplates open, moving toward the outside with only a slight clearance beyond the edge of the flask. Sand fills the flask from a minimum height, and there is no spillage, although sand extends above the flask well into the hopper.

At this point, the precompaction jolting begins while the hopper still is in position. It consists of a few strong, highly dampened jolts which compact sand near the pattern plate to a density approximating that of the finished mold. This density decreases steadily toward the top, with no change at all in the surface layer.

After precompaction, the shearplates close, leaving a layer of sand above the flask edge which is necessary for the jolt-squeezing of the final compacting. Excess sand is scraped back into the measuring hopper and is used, with a new filling, for the next mold. The shearing action, which, it will be recalled, is inclined from the edges toward the center of the flask, leaves a profiled layer of sand projecting above the top of the flask. This layer is higher at the edges than at the center.

The profiled sand bed then receives its final compaction through jolt-squeezing, in which it is compressed to a height slightly exceeding that of the flask edge. To minimize sand losses, the squeeze head carries a spring-suspended frame which prevents sand from being lost over the flask edge at the moment the squeeze head is moved against the sand. This precaution is necessary to achieve adequate density around the edge of the flask. The squeeze head also carries ribs which mold out small channels to provide for free escape of gas during and after pouring.

The final compaction is achieved primarily by jolting, and only to a minor extent by squeezing. It thus is possible to minimize the effect of friction in sand adjacent to the squeeze head and to obtain equal density in the finished mold. In contrast to the precompaction, the final compaction yields greatest density at the top of the mold, decreasing steadily toward the pattern plate. Thus the best possible equalization of sand density throughout the mold results.

Stripping Method—The mold is stripped by a pair of grippers on opposite sidewalls of the flask. This device permits the flask to be swung out and away from the pattern area immediately after stripping and lifting. The platelike reinforcements of the side walls of the flask are provided with vertical grip-

ping surfaces so that their position cannot be affected by sand particles. Gripping forces are applied horizontally in the direction of the rigid flask walls, with the points of contact moved close toward those walls. This arrangement reduces the possibility of flask distortion by the gripping forces.

The two pairs of gripping levers are operated by air cylinders mounted in a floating position. Gripping takes place only when all the levers have made contact with the gripper plates mounted on the flask. Gripping forces applied by each pair of levers are of the same magnitude and are so directed that no resultant force or moment is transmitted to the flask.

This design permits stripping the flask without deformation by the gripping forces and without distortion of the plane of the lower flask edge. Immediately after stripping, the flask is swung out of the area of the molding table and set down, ready for the transfer unit which places the mold on the main conveyor. With drag molds, the mechanism also turns over the finished mold before depositing it opposite the molding table.

Patterns—To provide utmost flexibility in the automated installation, the 22 x 27-in. pattern area is divided into three-quarter, one-half, one-quarter, one-eighth, and one-sixteenth plate areas. A choice of individual pattern plate sizes from the full plate area down to one-sixteenth therefore is available. This design makes it feasible to produce even small production runs—even 200 or fewer—with the lowest possible pattern cost. It also is possible to produce castings of greatly varying dimensions in one flask size.

To facilitate the change of divided pattern plates, a clamping frame holds and accurately locates the sectional pattern plates. The design also permits the combination of pattern plates of different thicknesses. Surface ground spacer frames are provided to bring the top planes of all sectional plates to exactly the same level. These spacer frames also carry electric heating elements with which the patterns can be heated. The vibrators necessary for the stripping operation are mounted in the clamping frame.

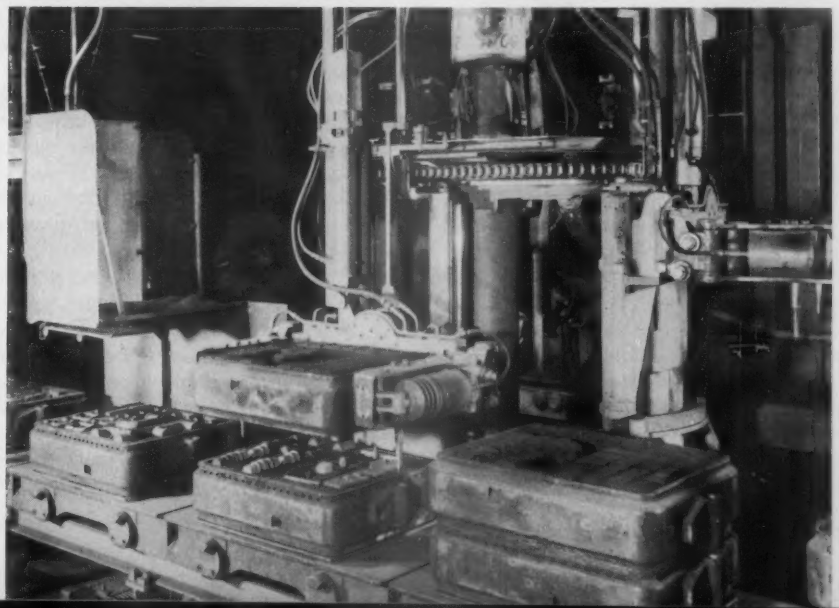
These arrangements permit pattern changes to be made in so little time that even very short production runs are practical on the automated installation. As a further aid, it is one of the duties of the production planning department to combine pattern plates calling for approximately the same production. Several pattern changes thereby can be combined in one operation.

Transfer and Closing of Molds—Transfer of the drag from the discharge conveyor to the main conveyor, transfer of the cope, and closing of the mold are performed automatically. Automation of these operations not only saves manpower, but also cuts scrap losses by closing the molds accurately. The flask is held steady and exactly parallel to the parting plane, and the motion over the guide pins toward the end of closing is slow and gentle. The clamping devices which grip and hold the flask are similar to those used in stripping.

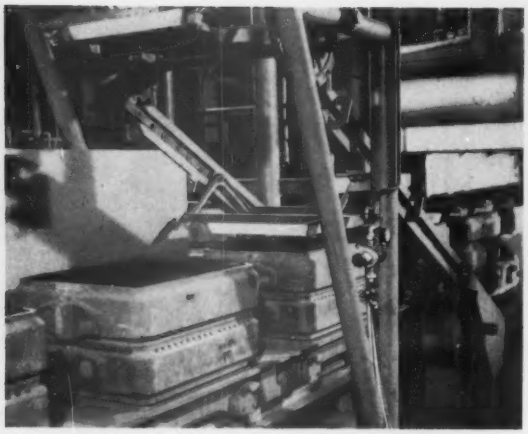
After stripping, the cope flask is deposited, with its edge adjacent to the parting plane, on the discharge conveyor. This conveyor constitutes an accurate horizontal support from which the flask is gripped, lifted, swung out over the drag on the main conveyor and, in accurate pin position, lowered onto the drag mold.

Because of variations in pattern heights, it is not always possible to obtain a top surface exactly parallel with the parting or pattern plane. It therefore is necessary to make certain corrections. When the drag mold is pushed along the discharge con-

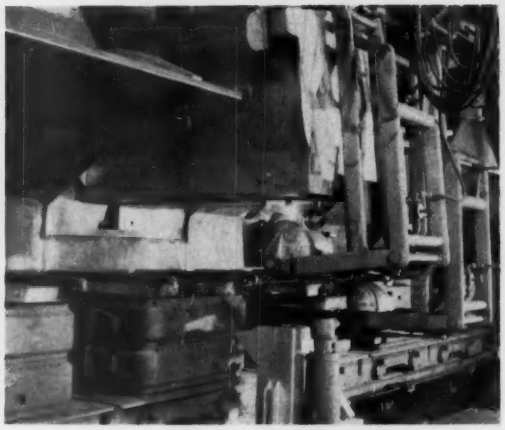
Coresetters stand on a floor conveyor traveling with the molds



A completed cope mold is brought into position above the corresponding drag. Closure takes place while molds move on conveyor



Weighing down molds prior to pouring



Stopper ladle fills the pouring ladle

veyor toward the transfer unit, it moves on horizontal rollers which support the flask edge. A scraper blade mounted between these rollers cuts the sand surface which resulted from the squeezing and makes this surface parallel to that of the parting plane. Parting line fins and variations in casting dimensions caused by uneven closing of the mold therefore are eliminated.

Pouring Method—Automatic pouring of large molds made by the partial pattern plate system presented a problem which is solved by molding a top runner system into the top of the cope. This system interconnects the pouring basin with the various downgates. The latter may be spaced over the entire mold, and they feed the individual patterns or groups of patterns in the flask.

To avoid a low yield, the pouring ladle is filled with the exact amount of metal necessary to fill one mold just to the top edges of the downgates. The amount of metal left at the bottom of the top runners is so small that the casting yield is better than normal. A combination of high capacity of the top runner system and weighing of the metal to be poured into each mold permits rapid filling. The entire top runner system then acts as a pouring basin. The actual pouring basin is situated in the same spot on every mold.

Tilting speed of the ladle can be adjusted to permit a faster flow than the combined capacities of the downgates. As a result, all ingates are covered quickly, and a high level is maintained to prevent entrance of air, slag, and oxides into the mold. Tilting is accomplished by rotating around the end of the ladle lip, thus providing a strong, compact stream with a minimum fall height. A grid core may be used on top of the pouring basin to furnish a damping action on the flow of metal into the runner system.

Automatic scales insure that the pouring ladles receive the correct amount of metal from a stopper ladle. The scales can be preset for any given amount, and they operate the stopper mechanism automatically. Movement of the ladle from scale to mold and back, adjustments for different flask heights, and tilting of the ladle are mechanized. One man supervises the pouring station and readjusts the scale setting each time a pattern change is made which calls for a different pouring weight. The entire pouring station, which operates with several pouring ladles, can handle about 100 molds per hour per ladle.

Top Runner System—The top runner system mentioned earlier is formed by a pattern molded into the top side of each cope mold. A gripping device draws the runner pattern automatically before the mold is stripped. The number of runner patterns required is held to a minimum by a design which permits position of downgates on each to be changed.

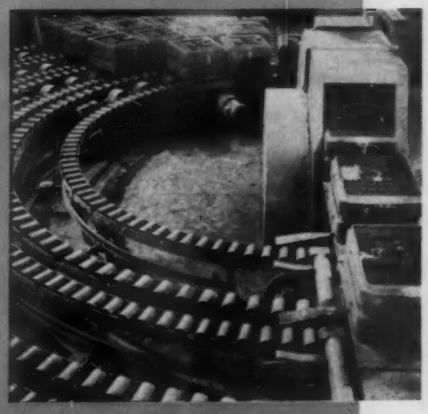
Weighing Down Molds—Because the top runner system permits placing the pouring basin in the same position in every mold, it was possible to develop an automated method of placing and removing weights on molds. Two endless chains, one on each side of the main conveyor, are provided with carriers in which the pouring weights are supported in a hanging position and always are horizontal to the surface of the mold. To deposit and remove the weights, the chains move with a given angle of inclination to the mold surface.

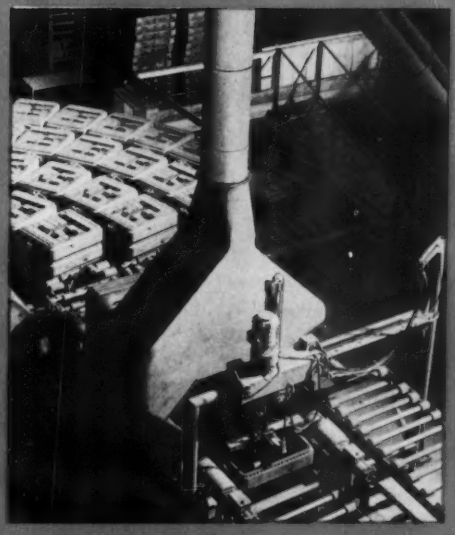
Speed of these chains is calculated to give a horizontal component which corresponds exactly to the conveyor speed. This arrangement and proper spacing of the weights insure that weights are deposited accurately on each mold, regardless of its height. If production is interrupted and one or more conveyor positions do not carry a mold, the weights are placed on the individual conveyor cars. The angle at which the chain approaches a mold is small enough to guarantee jolt-free depositing of the weight.

To avoid distortion of the platelike pouring weights, the plates are divided into four sections, each of which is suspended individually from a common supporting frame. Additional weights can be placed on these sectional plates if extra-heavy castings require them. Once weights have been deposited on the flasks, the chains disappear below the floor and reappear at the other end of the pouring section, where they pick up the plates again.

Pouring ladle in foreground tilts around lip to pour a mold on the moving conveyor. Ladle in rear is filled from the stopper ladle

Molds (foreground) are pushed off main conveyor and accumulate on individual cooling lines





Molds in background are held on four separate cooling sections ahead of the hooded shakeout

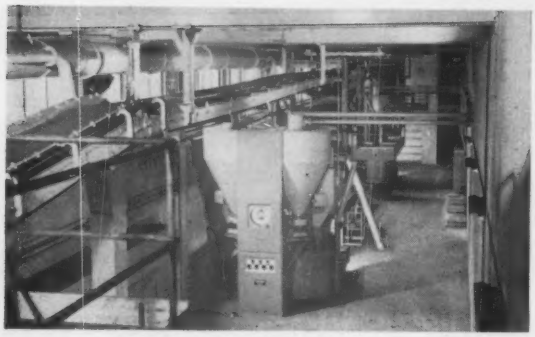
To change pattern plate, a new quarter-section plate is placed on top of the spacer frame

From this point, the chains carry the suspended weights above the pouring section and back to the point where they are deposited.

Mold Cooling Before Shakeout—Cooling time is held to a minimum to reduce burnout of clay and seacoal and to prevent mechanical trouble due to hot flasks. At the same time, since castings vary greatly in size and weight, it is necessary to provide for variable cooling times. The shortest cooling time is determined by the time required for the main conveyor to transport molds from the pouring station to the shakeout. It is possible to increase cooling time by accumulating poured molds prior to shakeout.

Molds are accumulated on four separate cooling conveyors. The cooling conveyors are adjacent to the main conveyor lifting station, where poured molds again are lifted from the return section below the floor. The cooling conveyor installation is not connected with the main conveyor, but is designed as a separate unit. Poured molds and their bottom plates are pushed off the main conveyor automatically. After a preset time interval, an automatic transfer conveyor withdraws molds individually and feeds them to the shakeout station.

In the Fischer installation, the molding "automats" operate with three compacting stations, each carrying a pattern. Three molds therefore follow each other in sequence on the main conveyor. One requires the shortest cooling time, the second takes medium cooling, and the third needs the longest time. Thus each is received by a different cooling



General view of the sand handling plant

conveyor. The fourth section is reserved for special purposes. This setup permits a range of from 6 to 25 minutes for cooling.

A separate control panel enables the operator to control the sequence of molds received by each section, to program withdrawals, and to hold a number of molds on each of the cooling conveyors. A counting device shows the number of molds on each conveyor at any time.

Shakeout and Flask Return—To prevent flask damage, the shakeout is damped by jolting against a support made of a material with an inherent high capacity for deformation work. A clean shakeout is achieved with only a few individual jolts, and the flask receives much lower jolting forces than if it were knocked against a rigid anvil with negligible elasticity.

The mold is held firmly against the shakeout frame by an automatically controlled device and emptied by three or four damped jolts. The flask remains steady against its support. After shakeout, cope and drag flasks are returned automatically on separate roller conveyors to their respective molding stations, in the correct position for use.

Sand Handling—From shakeout, the synthetic sand is returned to the sand handling plant, where almost the entire amount is reclaimed. Return sand contains an appreciable amount of live clay and active seacoal, and only a small proportion of the silica grains is destroyed by slagging or splitting. This sand is too dry and too hot for direct re-use. Cooling and mixing are done separately so that cool sand can be supplied to the mixing units.

The cooler uses the evaporation heat of water plus convection heat for cooling. An air stream is passed through a sand layer being conveyed by a broad perforated pan conveyor and carries off the heat of evaporation from the sand. Sand is discharged from the cooler at only slightly more than room temperature and with moisture content close to the dust limit.

Cooled return sand is fed via a magnetic pulley onto a vibrating screen with a 4-mm mesh. This screening is considered sufficient for the backup sand. All return sand passes over this screen onto a main distribution belt which extends over the various mixing units. The latter include two paddle mixers for backing sand and two mullers for facing. Individual sand feeds are adjusted by a scraper over each mixing unit. No storage bins are required.

To maintain a constant volume of sand, enough is deducted to compensate for core surplus. This deduction is made directly from the main distribution belt. Correct scraper settings for facing, backing, and refuse sand are obtained by watching the variations of sand height in the only silos in the system—those for prepared facing and backup sand.

Sand fed from the distribution belt to the backing sand mixers falls directly into the paddle mixers, but that for the facing first is screened through a 2-mm mesh opening and dropped into a weigh hopper. Two such hoppers with dustproof connections are above each muller. Correct charge weight is controlled by an automatic scale.

Additions of clay and seacoal are made similarly. These materials are fed from small storage bins into a separate, dustproof weigh hopper. The small bins are replenished pneumatically from a central supply station. Since all ingredients are weighed and the sand is screened through a fine mesh and supplied to the mill cool and with little variation in moisture, it is relatively simple for the automatic end-point controller to hold variations in moisture content to an absolute minimum.

After mixing, the prepared sand passes through an aerator into the storage bin, where it remains for about 30 minutes before reaching the molding stations. Turntables discharge the sand from the bottoms of the bins onto conveyor belts which feed the small silos above the molding stations. Electric feelers maintain sand level in the silos by automatically switching both storage bin turntable and conveyor belt on or off.

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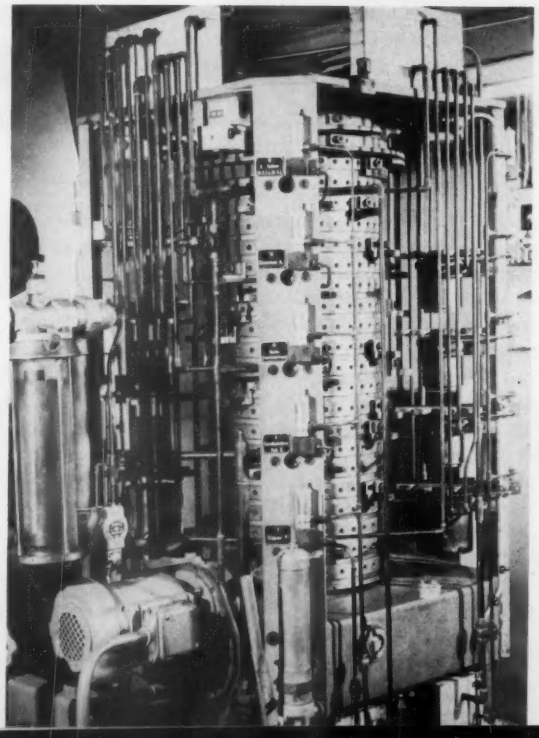


View of the program cycler. Standardized air valves are operated by drum-mounted cams

Cleaning department is 80 x 80 ft and has 25-ft ceiling. Fluorescent lamps were chosen for their low lamp brightness and low lighting cost

BETTER LIGHTING

Pays Off in Several Ways

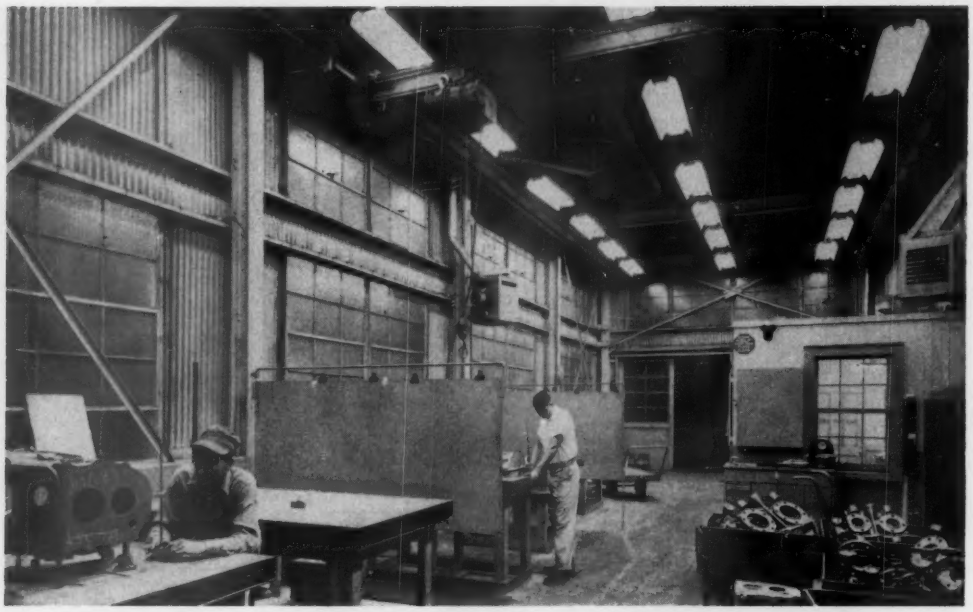
Here's a breakdown on a continuing program of lighting changes which reduced accidents, improved casting finish, raised morale of employees, and decreased loss of castings through breakage

By WILLIAM H. PURYEAR
Engineer
Lynchburg Foundry Co.
Lynchburg, Va.

LYNCHBURG Foundry Co.'s program of lighting improvement began in earnest about 1948 and since then has been one of continuing progress. Our procedure was to check the lighting level throughout the plant and then to set about bringing each delinquent department up to recommended lighting levels as set forth in standard lighting texts.

Our light meter investigations disclosed that our cleaning departments were operating with a light level of from 10 to 15 foot-candles. Since superior finish and careful cleaning are among the important selling features of our castings, we felt that we must have better lighted cleaning facilities.

We are a production jobbing foundry, and the variety of castings passing through the plant is almost limitless. Each one presents its own particular handling, stacking, and cleaning problems, and there is always a great deal of traffic into and out of the cleaning departments. Thus, inadequate lighting and the resulting poor visibility in our cleaning department had two bad effects: 1. It contributed to poorer casting finish. 2. It created a



Fluorescent lamps are used to soften shadows and reduce brightness of reflections from the metal parts on layout tables

safety hazard and caused breakage loss because of the moving traffic and the high stacks of cleaned and uncleaned castings subject to being knocked over.

Lighting Level Raised—We solved the problem by installing 40-watt fluorescent lamps in porcelain enamel industrial fixtures and raised the general light level to 35 foot-candles, with supplementary spot lighting at each cleaning station giving about 60 fc for careful work inspection. Needless to say, the increased lighting reduced the accidents and improved the casting finish and the workers' morale. Supervision was aided, too, in that the foremen could better follow the flow of work through the department.

Next, we moved to the inspection department where we found a light level of 30 fc. This was below recommended levels for the dimensional layouts which our quality control demanded, and we raised the level to 75 fc with the use of 40-watt and 90-watt fluorescents. Again employe morale went up and the time required to lay out and check castings decreased.

From inspection, we turned our attention to the machine shop where we machine customers' castings and do machining work for our maintenance and engineering departments. We already had a mercury light installation of about 30 fc and, by doubling the number of mercury lights, increased the level to 60 fc. The original system consisted of 400-watt mercury lamps alone, and in addition to the insufficient amount of light it was of depressing light quality. Our new installation mingles mercury and incandescent lamps in proportions necessary to produce "color correction." This color improvement was as welcome to the workers as the increased amount of light.

New Building Installations—In recent years we have removed two older buildings and replaced them with modern structures. In these buildings we installed color-corrected mercury lamps in the high bay areas and 40-watt fluorescent lamps in the low bay areas. The general lighting level throughout the building is 40 fc, again with supplementary spot lighting wherever seeing tasks require it. We have mingled a few 750-watt incandescent lamps with the mercuries in order to have emergency lighting quickly in the event of power failures (mercuries have a 4 to 6 minute restriking period after power interruption).

We have found the color-corrected mercury lights to be the answer to our high-bay problems in that they provide the most satisfactory illumination for the least money. Pure mercury lights would be less expensive, but our workers do not like the poor color rendition. In our low-bay areas we have found the 40-watt fluorescent type to be most satisfactory.

Our general yard lighting was improved to provide better illumination for such tasks as scrap breaking, coke and pig iron storage and movement, casting movement, and shipping. Our plant is bounded very tightly by natural barriers and our yard passageways are quite narrow. Hence, insufficient lighting coupled with heavy volume of traffic made our yard passageways hazardous for both pedestrians and lift truck drivers.

To sum up, our objectives in the lighting improvement program were threefold: 1. To make a better casting. 2. To improve employe morale. 3. To eliminate safety hazards. While we have kept no accurate records, we are sure that we have progressed toward our goals and plan to continue our efforts.

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Even, diffuse lighting was required at shipping dock to prevent shadows that could cause accidents with lift trucks. A 20-fc lighting level is provided with 40-w fluorescent lamps

To provide visibility needed in oddly shaped drafting room, lighting units were installed nonsymmetrically. Luminaires are mounted at an angle to drawing boards to reduce shadows

Reflector-type lamps in this booth provide localized lighting for the hand finishing of shell molded castings

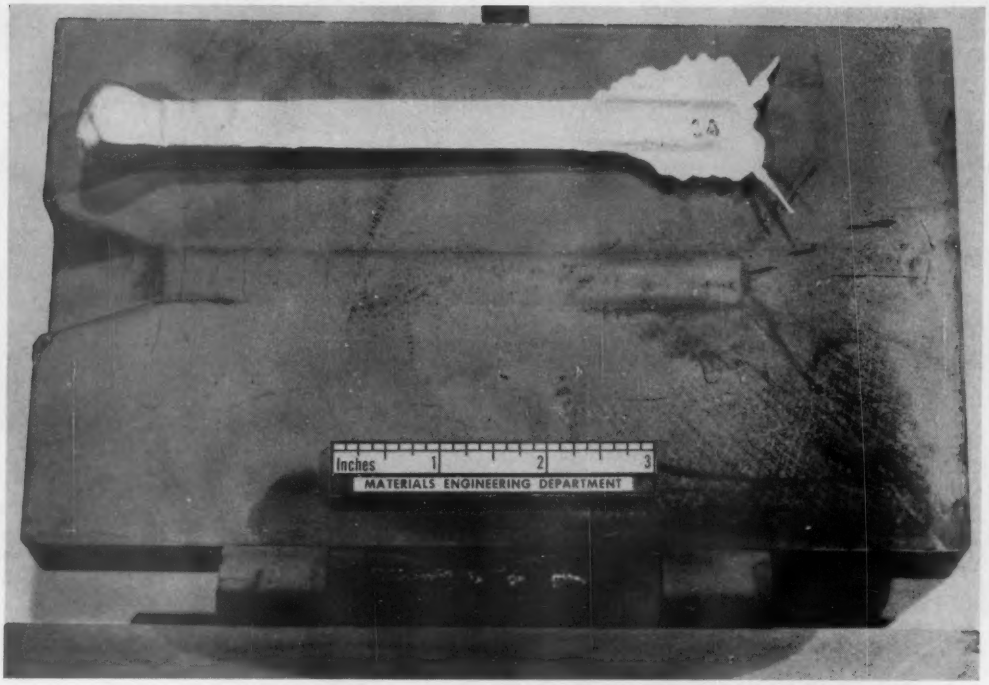

Fig. 1—Test bar ½ x 6 in. was cast by pouring into sample permanent mold

Mechanical Properties of Permanent Molded 355

A comparison of natural aging, artificial aging, and solution treating and aging of aluminum alloy permanent mold castings

THIS DISCUSSION provides a comparison of natural aging, artificial aging, and solution treating and aging of aluminum alloy permanent mold castings.

Solution treating of aluminum permanent mold castings prior to artificial aging is not always metallurgically desirable. The size or the shape of the casting may be such as to make a solution heat treatment impossible without undergoing excessive distortion or even failure, caused by the formation of high-quenching stresses.

Preparation of Samples—In an effort to determine the practicality of aging castings without a prior solution treatment, a heat of 355 alloy was prepared by melting down ingot stock purchased commercially. Thirty-two test bars, ½ x 6 in., were cast by pouring into the sample permanent mold shown in Fig. 1. Twenty-two of these bars were air-cooled and ten were quenched in cold water as they were taken from the mold. Before testing, all bars were machined to a 0.30-in. reduced section.

Heat Treating Cycles—To determine mechanical properties of permanent molded 355 alloy after natural aging, 12 test bars (6 air-cooled, 6 quenched) were held at room temperature for periods ranging from 1 hour to 96 hours before being tested. Eight bars were artificially aged at 155° C (310° F) for 1.5 and 3 hours before testing. Four of these bars were in the as-cast and air-cooled condition and four in the as-cast and quenched condition. Twelve specimens were solution-treated; of this number, five were artificialy aged at 155° C (310° F) for varying periods of time.

Discussion of Results—Table I outlines the heat-treating cycles employed and indicates the results of mechanical tests made on all specimens. An examination shows that natural aging produces no significant differences in the mechanical properties of either the air-cooled or water-quenched bars. Data are presented graphically in Fig. 2.

Yield strength values obtained by artificial aging without prior solution treatment were approximately 35 per cent higher than those developed by natural aging. One generally expects an average yield strength in 355T5 alloy of 24,000 psi, and it is interesting to note that after artificial aging, the test bars developed properties slightly under the expected minimum. Average yield strength after aging at

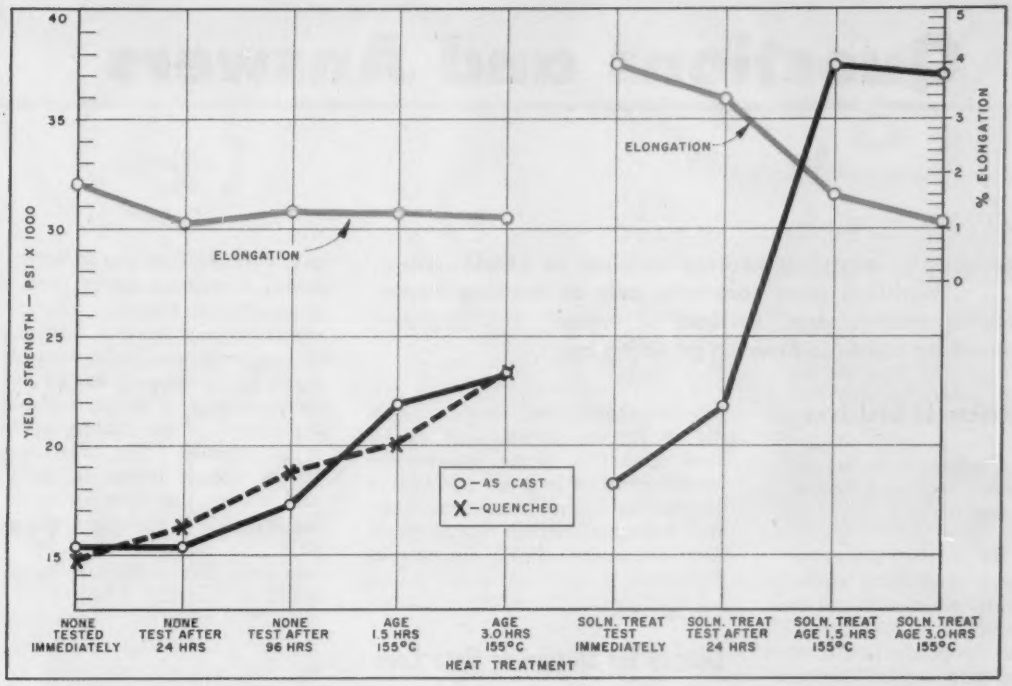

Fig. 2—Average values of yield strength and elongation for various treatments applied to alloy 355

Alloy Castings

By DONALD PECKNER
Materials Engineering Dept.
Westinghouse Electric Corp., East Pittsburgh, Pa.

155° C for 3 hours was 23,350 psi. It is apparent from Fig. 2 that the manner of cooling after permanent mold casting has no obvious effect on yield strength.

For high-strength applications, a solution treating and aging cycle is definitely required. This point is illustrated in Fig. 2 where it can be seen that the average yield strength, after solution treating and aging for 1.5 hours at 155° C (310° F), is approximately 61 per cent greater than yield strength values obtained after artificial aging only, and about 57 per cent above the minimum yield strength expected.

As a result of the heat-treating cycles applied to permanent molded 355 alloy, it is appararent that:

1. Artificial aging without prior solution treatment (T5 condition) will produce yield strengths approximately 35 per cent higher than those developed in as-cast and naturally aged castings.

2. Assuming that the casting design or size allows one to quench rapidly from the solution treating temperature, the solution treated and aged (T6) condition produces highest mechanical properties.

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TABLE I—Heat Treatment and Resultant Mechanical Properties of Permanent Molded Aluminum Alloy 355

	Spec. No.	Yld Str, psi, 0.2% Offset	Ten Str, psi	Elong, Per Cent
A. Test as soon as possible				
a. As cast 1	1C	15,850	21,300	1.7
2	2C	14,800	22,800	1.9
b. Quenched 1	1	14,700	22,050	1.8
2	2	15,100	*	*
B. Test after 24 hours				
a. As cast 1	3C	15,250	19,100	1.5
2	4C	15,250	18,700	0.9
b. Quenched 1	3	14,950	15,940	0.8
2	4	17,500	20,000	1.1
C. Test after 96 hours				
a. As cast 1	5C	16,900	20,300	1.1
2	6C	17,950	21,650	1.3
b. Quenched 1	5	18,250	23,800	1.6
2	6	19,450	*	*
D. Age 1.5 hours at 155° C				
a. As cast 1	9C	21,400	28,900	1.6
2	10C	21,940	30,000	1.6
b. Quenched 1	9	19,650	23,200	0.7
2	10	20,740	21,700	*
E. Age 3 hours at 155° C				
a. As cast 1	XC	23,200	24,750	*
2	C	23,500	29,700	*
b. Quenched 1	X	23,350	29,550	1.2
2	Y	23,350	27,100	*
F. Solution treated at 525° C for 12 hours—tested as soon as possible				
1	11	17,750	27,350	3.7
2	13	18,850	32,050	5.1
3	14	18,200	26,300	3.2
G. S.T., Test after 24 hours				
1	11C	21,650	34,200	5.0
2	12	21,350	33,000	1.3
3	15	22,450	33,000	2.7
4	16	21,400	33,600	2.4
H. S.T., Age 1.5 hours at 155° C				
1	12C	37,550	42,100	1.3
2	17	37,600	39,750	2.0
3	18	XX	44,250	1.8
I. S.T., Age 3 hours at 155° C				
1	19	35,800	37,950	1.3
2	20	38,350	43,300	1.2

*—Specimen broke in grips. Value indicated could not be calculated.
XX—Gage slipped before yield point was reached. Value not calculated.

Questions and Answers

Particular oxygen blowing process applies to steelmaking process . . . Modified gate core also acts as feeding head . . . Volatile vehicle used instead of water . . . Surface defect caused by sand . . . Making grinding burrs

Oxygen Blowing of Cast Iron

Have you published any articles on making steel by blowing oxygen on melted cast iron?

The process of making steel by blowing oxygen on melted cast iron does not apply to the foundry field, but rather to the production of steel to be poured into ingots. The process is carried out in large bessemer converters which are filled with molten iron from the blast furnace after 25 to 30 per cent steel scrap has been introduced. Then the molten material is blown with oxygen until the carbon is reduced to the desired point.

Possibly you may be referring to the use of oxygen in producing a rapid reduction of carbon in foundry steelmaking practice, but there is considerable difference between that and the preceding practice. In foundry practice the molten material in the furnace (open-hearth or electric) contains only 0.45 to 0.75 per cent carbon on melt-down, and that is reduced to 0.10 to 0.25 per cent by blowing oxygen for a few minutes.

That practice is used instead of the usual additions of iron ore to the furnace charge to develop the carbon "boil" since it shortens the time to produce steel. Oxygen blowing or lancing is not used by all steel foundries. Some information on the practice is given in "Use of Oxygen in Open-Hearth and Electric Furnaces" which appeared in the October, 1947, issue of FOUNDRY.

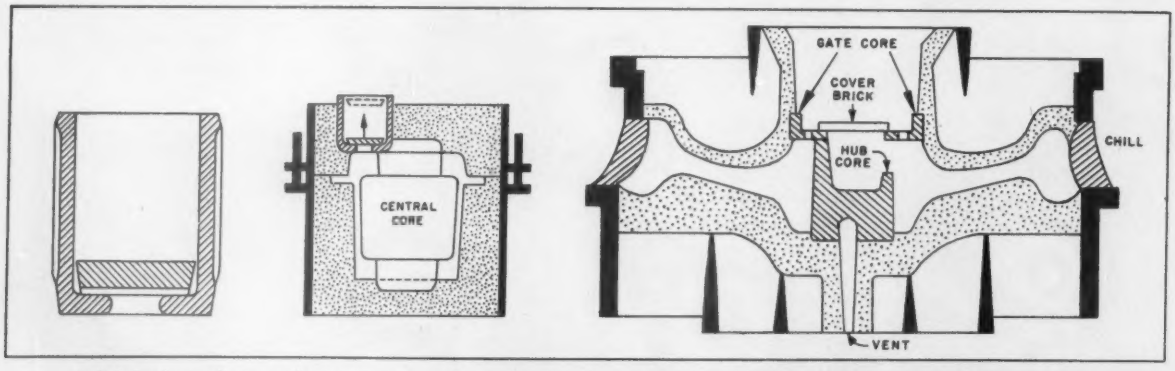
Details for Design of Gate Core

Some time ago we read of a new steel carwheel casting shop which was using an unusual gate on the hub. This gate, made in a core, consisted of a round pouring basin from which the metal was led through pop gates into the hub of the wheel. After the mold was full the small core inserts containing the pop gates were supposed to float to the top of the runner and then the enlarged opening permitted the large volume of hot metal in the runner to act as a head for feeding the hub. We tried a similar idea which looked beautiful except the insert cores did not float. We must have missed at least one point along the way.

We are forwarding two sketches which are different but which incorporate the idea you mention. In neither case, however, does the gate core float as you indicate. Instead, a separate cover core functions in that manner. One sketch shows a pouring and feeding cup arrangement used in Sweden. As indicated, the opening at the bottom of the cup is of a size suitable for the section of the casting to which it is attached. The core inserted in the cup is hexagonal in shape and covers the opening until the mold cavity is filled and then rises with the metal in the cup. It is said that the cover core keeps the metal in the cup hotter than if it were exposed to the atmosphere.

The other sketch shows the gating arrangement employed in one carwheel shop, and probably is what you have in mind. As you will note, it includes a fixed gate core, which rests on the hub core, and the opening in the hub core is covered with a cover brick. The latter is the part that floats after the mold cavity is filled. The gate core, containing 12 equally spaced holes around the periphery, is prevented from rising by the shoulders in the sprue opening of the mold. The hub core contains three large openings which also are equally spaced.

The opening into the hub core is covered with the circular cover brick, which, as in the previously described arrangement, remains in position until the mold cavity is filled, and then rises with the metal as it fills the cup or riser. Presumably the cover brick floating on the top of the metal in the riser or cup reduces the loss of heat through



Left is enlarged view of a gate core with application in center. At right is another type used on carwheels

radiation, and keeps the metal in a fluid state much longer than if the metal were exposed to the atmosphere. In the carwheel operation the cope is lifted about 50 minutes after pouring to shear the riser from the hub, and then set back on. Mold is shaken out about 12 minutes later.

Bonding Cores Without Baking

We are experimenting with CO_2 cores in our jobbing steel foundry, and most of the coreboxes are half boxes used in short runs. Is there a good method for bonding the half cores without the necessity of a baking operation?

A number of pasting or mudding compounds are available for mixing with a volatile vehicle instead of water. They can be allowed to air dry for a short period which eliminates the vehicle by evaporation, or the elimination can be speeded up considerably by igniting the vehicle with a torch or other means. Volatile vehicles include isopropyl alcohol, denatured ethyl alcohol, mixture of gasoline and carbon tetrachloride, etc.

Sand Condition Causes Defect

We are sending for your examination a piece of a gray iron plate with which we have trouble on the flat surface on the cope side. We pour this casting two up and believe that our gating system is all right. We are using a synthetic sand, mold hardness is from 80 to 85, and the mold is sprayed with a rubber-base coating. Approximate weight of the casting is 100 lb, and the defect is marked with yellow crayon.

Appearance of the defect marked on the cope side of the casting indicates that it is the result of a boiling action in the particular area. It is located over the heavy rib section, and we suspect it is at the ingate where the iron is hot for an extended period. Under those conditions the sand is not quite permeable enough to carry off the gases generated by hot metal in contact with the moist sand in the specific area, although the permeability is satisfactory for the adjoining thinner sections of the casting.

Possibly the moisture content of the sand is on the high side in relation to section thickness and heat capacity of the metal in the area; and a slight reduction might eliminate the trouble by reducing the amount of gas generated.

You ram your molds rather hard, which is good practice for providing castings with close dimensional tolerances, but the permeability of the sand must be higher than where mold hardness is lower. As indicated earlier, the present sand permeability apparently is satisfactory except under conditions of heavy section, hot metal, and extended exposure to heat. Perhaps an increase in permeability might solve the problem.

Easiest solution of the difficulty, but not necessarily the best procedure, is ample use of the vent wire in the troublesome areas. Its disadvantages are that it involves another step, and the possibility that the operator might forget it.

Making Feed Grinding Plates

We wish to cast feed grinding plates for a machine which we manufacture, and will appreciate detailed information. Are such plates usually cast in permanent molds? If so, we will appreciate any information available since our experience so far has been limited to sand molding.

Grinding plates or burrs for attrition mills, so far as we know, usually are made in green sand from a low-silicon iron or an alloy iron which will provide a hard, wear-resistant structure in the casting. Choice of material depends on what is expected. The unalloyed, low-silicon iron is lower in cost and will have a fair life. The alloyed iron is higher in cost, but has a much longer life which is said to overcome, on an over-all basis, the first cost differential.

If you decide that you wish to use a low-silicon unalloyed iron, the silicon content should be around 0.70 per cent, but it is suggested you experiment to determine the amount which will give the most satisfactory results. An alloyed iron used considerably contains 4 to 4.75 per cent Ni and 1.40 to 3.50 per cent Cr. Castings should be

Cope surface defect enlarged approximately twice size

stress relieved by heat treatment at 400 to 450° F before being placed in service.

Has Difficulty with Leakage

Our engineering requirements are such that we must use a bearing bronze to produce a pressure casting. From time to time we have considerable trouble and scrap loss because castings are found to leak after machining operations are completed. We assume that most of these leaks are caused by gas in the metal, if we rule out shrinks which are more easily controlled by proper gating and risering.

We are using an 80-10-10 copper-tin-lead bronze which is melted in a reverberatory type furnace. Castings are made in green sand, and wall sections range from 3/8 to 3/4 in., depending on casting size. Castings weigh 5 to 35 lb.

We are interested particularly in getting opinions on: Are defects which are minute and result in small leaks through the wall, due primarily to trapped gas in the metal or other causes? Is crucible melting better for our purpose than reverberatory melting? Is introduction of nitrogen into the metal proving successful or helpful in eliminating gas?

One difficulty with tin bronzes is their long freezing range and mode of solidification which makes them difficult to feed. Presence of gas in the metal complicates the feeding problem in that gas is believed to migrate into the narrow passages between the grains forming during solidification, and prevents filling the passages with feed metal.

Control of pouring temperature also is important. The usual practice is to pour at the lowest possible temperature. Pouring range for the 80-10-10 alloy is indicated as 1900 to 2200° F, and the most suitable range for each type of casting should be determined by experiment.

From your statement that the defective castings only show up from time to time, it appears likely that the trouble is due to gas or pouring temperature. It is possible, however, that gating and risering is a factor. We suggest that you fracture castings made on the "good" days and examine them for evidence of shrinky areas.

Since gassy metal is suspected, it is good practice before pouring to make a test plug as described in "Shrinkage in Tin Bronze" by Clyde L. Frear in the February issue, and examine the fractured surface. Briefly, the test plug is 1¼ in. square at the top, tapered to ⅞ in. square at the bottom, and 6 in. long. It is fed with a cup-shaped head 3½ in. in diam and 3 in. high. A saw cut is made in about the middle of the length, and the piece fractured.

According to the author, presence of gas is indicated by appearance of sharply defined dendrites on the fractured surface. Examination of the top of the cup riser also will help. If it "pipes" deeply it indicates freedom from gas, but if it swells or mushrooms, the metal is quite gassy.

If gas is present, the metal must be degasified, using any one of a number of materials such as copper oxide, lithium, copper boride, lead oxide, etc. Nitrogen degasification is being used to some extent with copper-base alloys with good results. Naturally, it is preferable to maintain melting conditions so that gas is not absorbed. That is accomplished by adjusting the furnace burners to provide a neutral or slightly oxidizing atmosphere in the furnace.

Proper furnace atmosphere condition best is determined by gas analysis apparatus. The alloy should be heated only sufficiently high to permit handling to the mold side at the proper temperature. Also, the metal should not be allowed to "stew" in the furnace for long periods. Molds should be waiting for the metal, not the metal waiting for molds.

As you undoubtedly know, gassy metal is encountered in crucible melting as well as in reverberatory melting. Although in the reverberatory a greater surface area of molten metal is exposed to the furnace atmosphere, proper control will minimize gas pickup. Once it is assured that a suitable atmosphere is present during melting—preferably determined by use of gas analysis apparatus — the burner valve controls should be locked to prevent tinkering by unauthorized personnel.

Employs Ethyl Silicate Bond

We will appreciate receiving any available information on the Shaw process.

The Shaw process is somewhat similar to the investment molding or lost wax process in that it employs an ethyl-silicate-bonded refractory to form the molds. An important difference is that regular patterns of wood or metal are used instead of disposable wax or styrene patterns. Refractory for the molds usually is sillimanite, and the hydrolized ethyl silicate employed as the bonding agent is mixed, just prior to use, with an agent which controls the gelling or setting action so that it may be adjusted to meet desired requirements.

This combination results in the formation of a rubber-like mold over the pattern in a short period of time, whereupon the pattern is removed from the mold without harm —even though the mold may be distorted in the operation—since it reverts to the original size and contour developed by the pattern.

After the mold is removed from the pattern, it is ignited to burn off the alcohol in the bonding agent. This ignition further hardens the mold so that it may be handled into an oven or furnace where it is baked at high temperature. Baking drives off the remaining moisture and forms a rigid structure to receive the molten metal.

Desires Corrosion Resistance

We operate a foundry in Mexico and are interested in making an iron which would be suitable to pump hydrogen sulfide. What would be the best analysis for the iron? We are looking for one that would be machinable, durable and wearable.

The difficulty in suggesting materials for use where corrosion is involved is that slight, but significant, variations in concentration, dryness, presence of other elements or compounds, pressure, temperature, etc., often result in marked changes in resistance of the material. It always is advisable, therefore, to test the material under service conditions or close simulations of them to determine its suitability.

With that in mind we suggest you try an alloy cast iron containing about 14 per cent nickel, 7 per cent copper, and 2 per cent chromium in addition to the usual elements present in gray cast iron. Total carbon of the iron should be around 3 per cent, while the silicon may vary from 1 to 2.5 per cent, and the manganese from 1 to 1.5 per cent. Amount of silicon, as in the case of gray iron, will depend on section thickness of the casting, being lower for heavy sections and higher for thin sections.

US RUBBER FOUNDRYGIANT CONVEYOR BELT

Tramp Iron can't go on a TEAR on this belt!

Hot foundry sand loaded with jagged pieces of tramp iron is a murderous combination for a conveyor belt.

That's why this leading Southern foundry uses U. S. FoundryGiant *RipStop* Conveyor Belts. These special heat-resistant belts have rip-stopping wire ribs imbedded in the carcass across the belt at 3' intervals to prevent the jagged pieces of metal flash, sprues, gates, geigers, etc., from going on a tear and wrecking the belt. Where previous belts lasted only 2 or 3 months, the "U. S." belts are lasting 8 times as long!

Two FoundryGiant cotton-nylon belts convey the tramp-infested hot sand from both the shakeout and sand-slinging unit to storage bins. These thinner belts, made possible by the considerably stronger cotton-nylon carcass, allow for much more efficient tramp iron removal by keeping the load closer to the core of the magnetic field of the head pulley.

"All in all," says this smooth-running foundry's master mechanic, "these belts save us about 500 man-hours a year in belt repair and replacement. We're very happy with their performance."

U. S. Rubber Conveyor Belts for every foundry requirement (along with expert "U. S." engineering assistance) are available at your convenient "U. S." distributor, or by contacting us at Rockefeller Center, New York 20, N. Y. In Canada, Dominion Rubber Co., Ltd.

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Circle 593 on Page 117

Men of Industry

● DONALD McDANIEL
. . . foundry executive retires

● D. B. BEATH

● L. G. PROBST
appointments, Foundry Services Inc.

● W. T. ELLISON
. . . joins Michigan Standard

DONALD McDANIEL, vice president, Hamilton Foundry & Machine Co., Hamilton, Ohio, and president, Decatur Casting Co., Decatur, Ind., has retired. He will continue as a director of both companies. Mr. McDaniel joined Hamilton Foundry as production manager in 1918, became first vice president in 1927, a director in 1934, and secretary in 1941. One of the founders of Decatur Casting Co. in 1920, he became a director and general manager at that time, president in 1927, and treasurer in 1941. Mr. McDaniel was one of the organizers of the Ohio State Foundrymen's Association and its president from 1929 to 1931. He also aided in organization of the Gray Iron Institute, and when the Gray Iron Founders' Society succeeded it in 1935 he served as a director for seven years.

J. M. Crockett, assistant to the vice president in charge of gases, Air Reduction Sales Co. Div., Air Reduction Co., New York, has been appointed manager of the Birmingham district, succeeding **W. L. Poole,** who has been named sales consultant in Birmingham. Mr. Crockett became an assistant metallurgical engineer with Air Reduction in 1945 and has held various management positions in the company's New York office.

Raymond Heiden has been appointed vice president, Galva Foundry Co., Galva, Ill. **H. L. Marlatt,** formerly assistant controller, has succeeded Mr. Heiden as treasurer of the company.

● **D. B. Beath** has been named central regional sales manager, and **L. G. Probst,** eastern regional sales manager, Foundry Services Inc., Columbus, Ohio. From 1952 to 1957 Mr. Beath was district sales manager, DeWalt Inc., Lancaster, Pa., and previously was a sales representative, Walworth Co., New York. Mr. Probst, formerly foundry division sales manager, National Engineering Co., Chicago, has also been associated with Lynchburg Foundry Co., Lynchburg, Va., and Bethlehem Steel Co., Bethlehem, Pa.

Harry H. Wetzel has been appointed manager, AiResearch Mfg. Div., Garrett Corp., Los Angeles, succeeding **Claude N. Monson,** who has been appointed vice president in charge of contract administration. **Wilton E. Parker,** formerly sales manager and chief engineer, has assumed Mr. Wetzel's former duties as manager of the company's AiResearch Industrial Division.

Malcolm J. Glenny has been elected chairman of the Council of Ironfoundry Associations, London. He succeeds **N. P. Newman,** who held the office for 10 years. Mr. Newman remains president of the Joint Iron Council, which includes the Council of Ironfoundry Associations and the Council of Iron Producers. Mr. Glenny is a director of the Dover Engineering Works Ltd., Dover and London. Mr. Newman, is chairman-managing director, Newman, Hender & Co. Ltd., Woodchester, Glos.

● **W. T. Ellison** recently joined Michigan Standard Alloy Casting Co., Detroit, division of Consolidated Foundries & Mfg. Corp., Chicago, as chief engineer. A graduate of Lawrence Institute of Technology, he has an extensive background as a design engineer of industrial furnaces, ovens, and automated equipment.

A. M. Klinger has been named sales manager of materials handling products, Ingersoll Kalamazoo Div., Borg-Warner Corp., Kalamazoo, Mich. He has been district sales manager for the division since 1955. Previously he was Michigan sales manager, Delco Appliance Div., General Motors Corp., Rochester, N. Y.

Robert J. Sloan has been elected president, Crouse-Hinds Co., Syracuse, N. Y., succeeding **J. R. Tuttle** who continues as chairman of the board. **Raymond W. Cummings** has been named secretary. Mr. Sloan, with the company since 1923, became secretary and a director in 1951, and executive vice president in 1956.

Jack Greer has been appointed midwestern regional manager, Hyster Co., Portland, Oreg., in a recent sales re-organization within the company consolidating various district sales areas into four sales regions. Mr. Greer was formerly mid-central district manager. **Donald Shaffer,** who was northeast district manager, has been made western regional manager. **Robert W.**

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Circle 594 on Page 117

● NED W. ROUDABUSH
. . . sales-service mgr.

● W. KENT MATHIAS

● PHILIP O. GEIER JR.

Cincinnati Milling Machine promotions

● MORTON GALISON
. . . foundry sand sales

Hill, previously manager of the southern district, has been appointed southern regional manager. **John B. Hall**, manager of the new eastern region, was formerly assigned to railroad sales and as representative for the lumber and building supply industries.

● **Ned W. Roudabush** has joined the Refractories Div., H. K. Porter Company, Pittsburgh, as manager of basic sales and technical service. For the last ten years he was with General Refractories Co., Philadelphia, in research and technical sales development.

● **John G. Frischkorn Jr.** has been named sales manager, Cleveland Tramrail Div., Cleveland Crane & Engineering Co., Wickliffe, Ohio, succeeding **A. F. Anjeskey**, who has retired after 38 years with the company. Mr. Frischkorn served as engineer for the division's overhead materials handling equipment, became district sales manager, and last year was named assistant sales manager. Previously he was with Euclid Crane & Hoist Co., Cleveland.

● **Philip O. Geier Jr.** and **W. Kent Mathias** have been elected vice presidents, Cincinnati Milling & Grinding Machines Inc., sales subsidiary, Cincinnati Milling Machine Co., Cincinnati. Mr. Geier, who has also been made a director, has been with the parent company since 1939 and is manager of the Products Div. Mr. Mathias, manager of the Grinding Machine Div., has been with the parent company since 1937.

● **Louis F. Fow** recently joined Cooper Alloy Corp., Hillside, N. J., as sales supervisor for the Foundry Products Division. He was formerly with Lebanon Steel Foundry, Lebanon, Pa., and Misco Precision Casting Co., Whitehall, Mich.

● **John E. Hewson** has been appointed sales manager of the New York region, Foxboro Co., Foxboro, Mass., to cover New York city and sections of Connecticut and New Jersey. He succeeds **E. H. Huckman**, who has been named assistant field sales manager. **D. T. McElligott**, since 1953 field engineer in Dallas and El Paso, Tex., has replaced Mr. Hewson as manager of the Tulsa, Okla., branch. **J. M. Flanigan Jr.**, formerly of the Dallas branch, will cover the El Paso area.

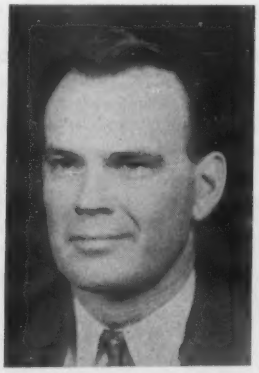
● **Morton Galison** recently joined Delhi Foundry Sand Co., Cincinnati, as eastern sales representative, with headquarters at 210 Riverside Dr., New York. Since 1950 Mr. Galison has been associated with foreign trade companies, including his own, and Summit Trading Corp., specializing in the sale of raw materials. Previously he was affiliated with chemical process and petroleum design construction firms in the United States and South America.

Thomas E. Sheehan recently joined Permanent Mold Die Co., Hazel Park, Mich., as factory sales representative where he will handle sales of light alloy tooling for the automotive industry, specializing in diecasting dies, permanent molds, and casting equipment.

● **William N. Brammer** has been appointed sales manager, Pressure Castings Inc., Cleveland. **Marshall P. Ralls** continues as assistant sales manager, assistant secretary and ad-

● JOHN G. FRISCHKORN JR.
. . . division sales mgr.

● LOUIS F. FOW
. . . joins Cooper Alloy Corp.



● JOHN E. HEWSON
. . . regional sales mgr.

● WILLIAM N. BRAMMER
. . . joins Pressure Castings

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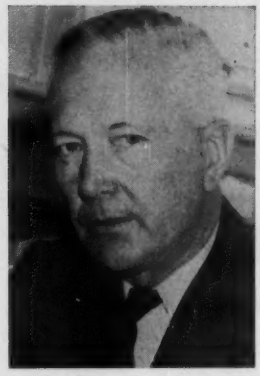
Circle 595 on Page 117

● **AUGUST D. DIEDRICH JR.**
. . . Bay State Abrasive sales

● **JOSEPH R. DRIEAR**
. . . atomic fuel engineer

● **ARTHUR B. PENTERS**
. . . ADM foundry supply sales



● **LESTER J. MILLER**
. . . becomes executive v. p.

vertising manager. Mr. Brammer since 1952 had been eastern sales manager for Apex Smelting Co., Chicago.

● **August D. Diedrich Jr.**, for the last five years associated with Midwest Abrasive Co., Detroit, has been appointed sales representative in the Michigan district, Bay State Abrasive Products Co., Westboro, Mass., with headquarters in Detroit.

M. K. Shetler, since 1956 central Ohio regional sales manager, Coated Abrasives Div., Armour & Co., Alliance, Ohio, has been appointed central division sales manager. Mr. Shetler will supervise sales activities in Ohio, western Pennsylvania, western New York, and western West Virginia.

George E. Armington has joined Euclid Crane & Hoist Co., Euclid, Ohio, as vice president-engineering. He was graduated from Ohio State University and later attended Massachusetts Institute of Technology. One of the founders of Euclid Road Machinery Co., now the Euclid Div., General Motors Corp., Mr. Armington recently was director of engineering there.

Charles Kannapell, formerly in the home office, American Air Filter Co., Louisville, Ky., has been transferred to Washington. Other changes in the sales organization include **Collins Hamblen,** moved to New York from Washington, and **Charles Jacobs,** transferred to New York from Minneapolis.

Harry O. Walp Jr. has been named product manager for vacuum heat treating furnaces, Vacuum Equipment Div., F. J. Stokes Corp., Philadelphia. He joined the company's sales staff in 1952.

● **Joseph R. Driear** has been appointed senior engineer-nuclear fuels, Atomic Fuel Dept., Westinghouse Electric Corp., Cheswick, Pa. After graduation from Colorado School of Mines he was associated with E. I. DuPont De Nemours & Co., Wilmington, Del., at the Argonne National Laboratory and Savannah River Plant as process supervisor, atomic energy. For the last three years he has been supervisor of the metallurgical laboratory, Eaton Mfg. Co., Detroit.

● **Arthur B. Penters** has been appointed sales representative in the western Michigan area, Federal Foundry Supply Div., Archer-Daniels-Midland Co., Cleveland, replacing **Joseph Hekler,** who has been assigned to the eastern Michigan area. Mr. Penters was formerly with Ferro Machine & Foundry Inc., Ford Motor Co., and White Motor Co., Cleveland.

A. P. Bowman has been named manager and **James I. Onarheim** manager of utility sales in the Milwaukee district office of Allis-Chalmers Mfg. Co. **Carl R. Hall** has been made manager of the Rockford, Ill., branch, a position Mr. Bowman has held since 1956. Since 1948 Mr. Onarheim has been sales representative in Milwaukee. Mr. Hall for the last 7 years has been in the Wichita, Kans., office.

Donald A. Dalton has been appointed general superintendent, Dalton Foundries Inc., Warsaw, Ind. **H. R. Clingenpeel** has been named foundry superintendent.

Ben Kaufman has been elected vice president, H. Kramer & Co., Chicago. He will continue as general manager of the Ajax Metal Div., Philadelphia.

● **Lester J. Miller** has been named executive vice president, A. P. Green Fire Brick Co., Mexico, Mo. With the company since 1923, he became vice president in 1942, director of manufacturing in 1947, and vice president-operations in 1954. He was made a director last year.

J. D. MacKenzie has been elected president, American Smelting & Refining Co., New York. **R. W. Vaughan,** formerly president, has been named vice chairman of the board and **Kenneth C. Brownell** continues as chairman. **R. L. Jourdan** has been made vice president. Mr. MacKenzie, with the company since 1920, has been vice president in charge of operations since 1948 and a director since 1949. Mr. Vaughan joined Asarco in 1937, became vice president-general counsel in 1947, and president in 1957. Mr. Jourdan entered the company as a chemist-metallurgist in 1922 and since 1941 has been manager of the ore purchasing department.

R. S. Bradshaw Jr. has been named president-general manager, Texas Foundries Inc., Lufkin, Tex., succeeding the late Col. Cal C. Chambers. **Jack O. Klein** and **Cal C. Chambers Jr.** have been named directors. Mr. Bradshaw, a graduate of Yale University, was associated with Southern Malleable Iron Co., St. Louis, until 1938. When Texas Foundries was organized at that time he became plant manager, later serving as vice president and plant manager.

James MacDonald has been elected executive vice president, General Steel Castings Corp., Granite City, Ill. He has been a vice president of the company since 1947 and a director since 1950. **Richard T. Risk,** elected a vice president, will

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● **CHARLES R. GEBEL**
. . . Pittsburgh branch mgr.

● **JAMES E. ABSHIRE JR.**
. . . joins Porter Warner

● **EARL L. JOHNSON**
. . . joins Cast-Master Inc.

● **HARRY M. DENT JR.**
. . . district sales mgr.

continue as treasurer, a position he has held since 1954. **Winthrop B. Reed**, for the last year manager-eastern sales, has been elected a vice president in charge of operations at the Eddystone, Pa., and Avonmore, Pa., plants.

● **Charles R. Gebel** has been appointed manager of the new Pittsburgh branch office, Electrode Div., Great Lakes Carbon Corp., New York. Prior to joining the division in 1954, he was with Kaiser Aluminum & Chemical Sales Inc., Chicago, Jones & Laughlin Steel Corp., Pittsburgh, and Timken Roller Bearing Co., Canton, Ohio.

Paul W. Beamer, until recently manager of metallurgical development-research, Austenal Inc., New York, has been appointed manager, sales and development, Utica Metals Div., Kelsey-Hayes Co., Utica, N. Y. **Dr. Eugene S. Machlin**, on leave from his position as associate professor of metallurgy, Columbia University, has been appointed acting director of research for Utica Metals Division.

● **James E. Abshire Jr.** has been named sales representative and sand consultant, Porter Warner Industries Inc., Chattanooga, Tenn. For the last nine years he has been engaged in sand research with Ross-Meehan Foundries Inc., Chattanooga. Mr. Abshire is treasurer of the Tennessee Chapter, American Foundrymen's Society.

● **Earl L. Johnson** has been appointed central western representative, Cast-Master Inc., Bedford Heights, Ohio, to cover northern Illinois and southern Wisconsin, with headquarters in Des Plaines, Ill. Until recently he was assistant plant manager, Ainsworth Precision Castings Co., Chicago, division of Harsco Corp., Harrisburg, Pa.

● **Harry M. Dent Jr.** has been appointed a district sales manager, Durez Plastics Div., Hooker Electrochemical Co., North Tonawanda, N. Y. With headquarters at the home office in Niagara Falls, N. Y., he will cover New York (excluding New York city and the Hudson River area), western Pennsylvania, Ontario, and Quebec. Mr. Dent entered Durez sales after graduation from Hamilton College in 1948.

Roger Waindle, president, Wai-Met Alloys Co., Detroit, division of Consolidated Foundries & Mfg. Corp., Chicago, was official representative of the Investment Casting Institute at the European Investment Casting Association meeting held in Paris last month.

NATIONAL CASTINGS COUNCIL: Representatives of various foundry organizations making up the NCC who participated in the Council's annual meeting in Cleveland, May 12. Front row, left to right: G. Dixon Shrum, FFMA; Einar A. Borch, FEMA; Ross L. Gilmore, SFSA; G. E. Seavoy, FEMA; Bradley B. Evans, ACI; Howard F. Park Jr., SFSA; F. Ray Fleig, FFMA; Frank G. Steinebach, FEF. Second row, left to right: R. C. Garland, GIFS; Donald H. Workman, GIFS; Herbert F. Scobie, NFFS; Frank X. Bujold, FEF; Henry J. Trenkamp, GIFS; F. Kermit Donaldson, SFSA; Arthur G. Hall, NFA; E. A. Schoefer, ACI; R. C. S. Potter, NFA. Third row, left to right: R. R. Miller, ICI; Lowell D. Ryan, MFS; James W. Early, FFMA; Francis M. Fahrenwald, ACI; Robert Langsenkamp, NFFS; Charles Sheehan, NFA; Edward Walsh, FEF.

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Circle 598 on Page 117

Casts Large Propeller with CO_2 Process

Ramming up the first drag section of the propeller with a facing of 75 AFS grain fineness silica sand. Single-bladed pattern is used

Pattern has been removed and CO_2 probes inserted in the mold. This method cut time by 95 per cent and machining costs by 90 per cent

After completion of all eight sections, workmen make final inspection before closing the mold. They gas any areas which require it

BETHLEHEM Pacific's San Francisco shipyard recently cast what is believed to be the largest marine propeller ever produced in the United States by the CO_2 molding process.

Weighing 41,500 lb unfinished, and with a 19½-ft diam, a 45-in. height and a 44-in.-diam hub, the huge four-bladed propeller will be used as a spare for the *SS Angelo Petri*. Built at the same yard last year, the ship is now in service transporting bulk wine from the Bay area to Gulf and eastern seaboard ports.

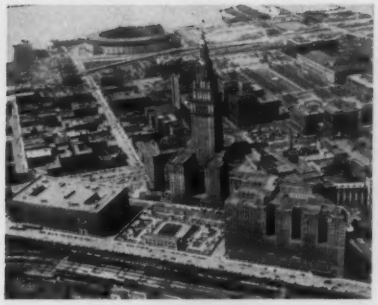
In casting the spare propeller, John Grahovac, foundry foreman, was faced with some difficult problems—shortness of time in which to get the job done, a shortage of skilled foundrymen, and the possibility that buckling might occur in the flat surfaces of such a large casting.

He decided to use the CO_2 process, a decision based on success in casting smaller multi-bladed propellers and other parts. With the CO_2 process a time saving of 95 per cent over previous molding and drying methods was achieved, as well as a 90 per cent saving in machine shop costs. Dry sand molds formerly used required baking at 300 to 400° F for periods up to 75 hr.

Binder cost also is reduced by using a mold facing of No. 75 AFS silica sand backed up with heap sand. A single-blade pattern was used and the drag rammed, one section at a time. After each section is rammed, the pattern is removed and the section gassed with probes and rubber cups. Then the pattern is replaced in one section at a time and a cope flask section set in place. Each cope section is

PHOTO QUIZ:

Do you know the answers to these questions on the AFS Castings Congress and Foundry Show?



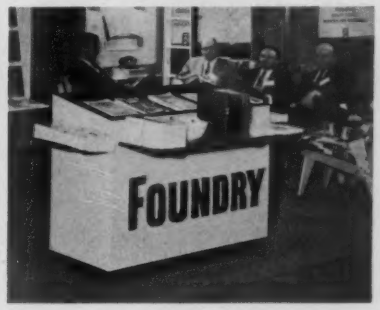
1. In what location are more than 15,000 foundrymen expected to gather to see extensive exhibits and hear informative technical discussions on new foundry operating practices?

2. What are some of the interesting points that will come out in the technical sessions, say for instance at the sand sessions devoted to use of the CO_2 process for production of cores?

3. Of more than 200 extensive displays of new equipment and supplies at the AFS Foundry Show . . . which will interest you the most . . . machines . . equipment . . materials . . supplies . . or services?

4. Which developments and interesting points will be brought out in the technical papers presented, as an example, at the session on the design of plastic patterns and coreboxes?

5. What interesting castings and patterns made by apprentices will be shown, and who won the national awards in five divisions of the annual AFS Apprentice Achievement Contests?



6. What techniques will FOUNDRY magazine employ to give you detailed coverage of the Congress and Show, including technical discussions and other highlights?

The answers to these questions, plus many more facts and figures on the AFS Castings Congress and Foundry Show, May 19-23, will be specially presented in July POST-CONVENTION issue of FOUNDRY

This issue will offer a complete coverage of convention activities. A special editorial section will give you a first-hand news and photo reporting of technical papers presented; new foundry equipment and supplies; award winners; highlights of the convention . . . plus all regular editorial departments.

You'll be able to have all the answers on the Castings Congress and Foundry Show when you get a copy of the July POST-CONVENTION issue of FOUNDRY. Be assured of a complete coverage of all convention activities.

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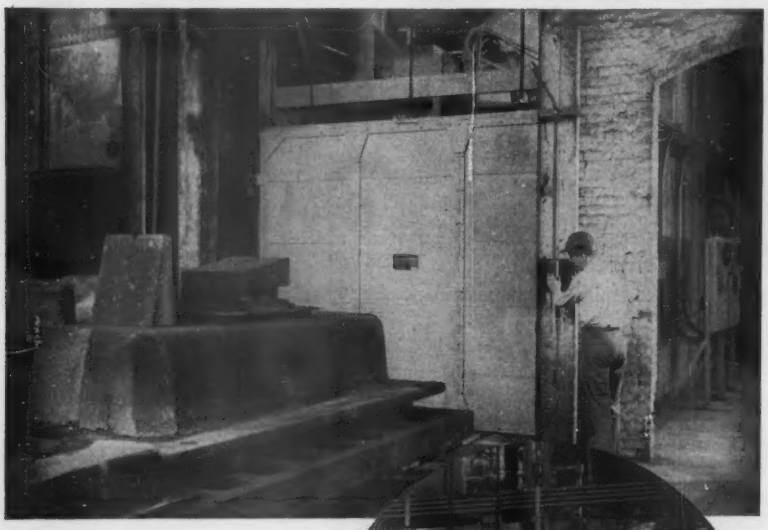

CAR TYPE CORE AND MOLD OVEN

Above—A difficult engineering and installation problem solved by Carl Mayer because the oven filled this space completely. This modern oven, with patented down draft heating system and motor operated lift door, replaced an obsolete brick oven.

RACK TYPE CORE OVEN

Right—Installed at rear of mold oven to form an efficient, flexible combination. Miscellaneous cores are uniformly baked with modern, automatic controls. Operation is efficient and economical.

Carl Mayer's outstanding engineering and design features sold the steel mill where these ovens are now in operation. They incorporate the exclusive Carl Mayer recirculating heating system and special triple slotted panel construction.

Heat loss is reduced up to 1/3, and fuel savings up to 50% over old conventional methods are possible. Temperature uniformity is guaranteed.

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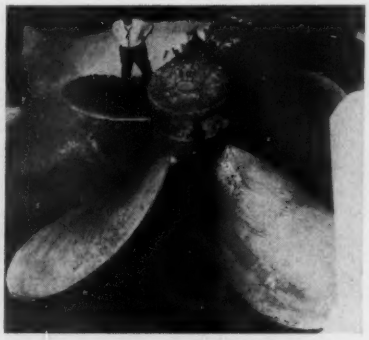
rammed with a sodium silicated-bonded sand facing, gassed with probes and drawn so the single-blade pattern can be shifted. When all mold sections have been completed, the mold is closed and the cope backed with heap sand.

The propeller hub core was made in halves with a sweep and a wooden guide frame on a perforated plate.



View of the completed propeller in as-cast condition

The frame then was partially filled with sodium silicate—bonded sand and wires set. Additional sand was added and the core swept. The guide frame then was removed and a wooden box placed upside down over the core. Two holes in the top of the box permit gassing, which took only 30 seconds.

Phenothalin sometimes is added to the binder in the sand to aid in determining how long to gas the mold. The phenothalin returns to a white color when the gassing process is complete.

Book Review

ASTM STANDARDS ON IRON CASTINGS, paper, 160 pages, 6 x 9 in., published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. price $2.75.

For the first time, foundrymen, metallurgists, purchasing agents and others interested in iron castings have at their fingertips all the ASTM standards and tentatives relating to those castings in a single volume.

Contents of the book include one standard on pig iron, six on gray iron castings, three on cast iron pipe, three on nodular iron, four on malleable iron, one on welding rods and electrodes, nine on general testing methods, two on recommended practices, and three on definitions.

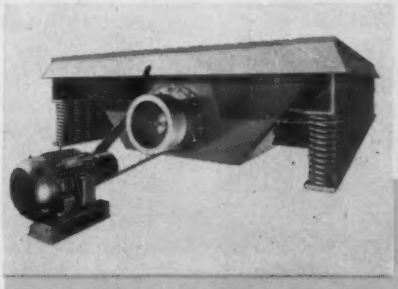
Circle 599 on Page 117

For Foundry Air

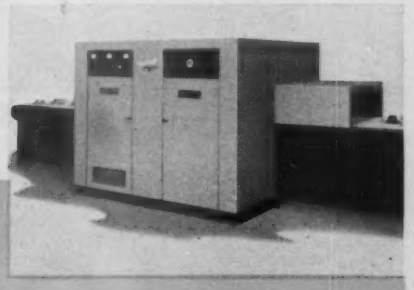
Ro-Flo compressors cut vibration, eliminate wear and tear

Rotary motion of Allis-Chalmers compressors practically eliminates vibration and shock. There are no reciprocating parts — no pistons, valves or connecting rods to cause trouble. These factors reduce maintenance to a minimum. Another important advantage is the constant efficiency inherent in rotary design. Centrifugal force holds vanes tightly against cylinder wall under all conditions. Smooth, vibrationless operation eliminates need for heavy, costly foundations.

Many types and sizes — Single-stage units for pressures to 50 pounds gauge, and volumes from 42 to 3245 cfm. Two-stage units for 250 to 1800 cfm at pressures from 60 to 125 pounds gauge. For details ask your A-C man for Bulletin 16B8244 (two-stage) and Bulletin 16B8126 (single-stage). Or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.



***Foundromatic* shakeout.** For fast knockout of heaviest castings and flasks. Rated capacity of *Foundromatic* shakeout is over twice its weight. Bulletin 07B6365B gives all the details.



***Foundromatic* Dielectric Sand Core Oven.** There are 14 distinct advantages in using this fast, modern method of core baking—and each will save you money. Bulletin 15B7306D gives the complete story.

Ro-Flo and *Foundromatic* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

A-5742

Industry Briefs

CHICAGO Hardware Foundry Co., North Chicago, Ill., has completed a new $100,000 building for production of nonferrous castings. This step is the second in a three-stage expansion program which will provide the CHF Non-Ferrous Div. with a completely new, integrated unit for processing nonferrous castings, from receipt of ingot to shipment of finished product. The second stage doubles nonferrous casting production facilities. CHF also is proceeding with improvement plans for nodular iron, shell molding, and shell coring facilities.

Augusta Foundry Co., Augusta, Ill., will build a branch, Fairfield Foundry Inc., at Fairfield, Ill. It will employ 25 to 50 persons and will be housed in a new building.

Electro Minerals Div., Carborundum Co., Niagara Falls, N. Y., has opened a product development laboratory. The new facility contains a variety of laboratory equipment for product development and testing. It also provides pilot plant facilities to develop manufacturing processes required for new products and to improve processes used in existing plants.

Detroit Gray Iron & Steel Foundries Inc. has been chosen as the new name of the former Detroit Gray Iron Foundry Co., Detroit. The change was made to reflect better the products of the parent company and its subsidiaries.

West Central Sales Div., Harbor Steel & Supply Corp., Muskegon Heights, Mich., has been appointed Western Michigan distributor for Quaker Rubber Division, H. K. Porter Co., Philadelphia.

Dura-Bond Bearing Co., Palo Alto, Calif., has purchased Sandshell Corp., Santa Clara, Calif., which will continue to produce shell molded castings of brass, bronze, aluminum, and special purpose compositions. Dura-Bond makes automotive engine parts.

ENGLISH AUTOMOTIVE FOUNDRY: The semiautomatic molding machine shown here is one of 16 along an 800-ft continuous conveyor at the new Thames Foundry of Ford Motor Co., Dagenham, England. Said to be the most modern of its type in Europe, the new foundry is planned for a daily capacity of about 400 tons of gray iron castings—mostly cylinder blocks and heads and larger castings for tractors. Total floor area of the plant is 533,200 sq ft. These molding machines were manufactured by Osborn Mfg. Co., Cleveland

Victor Equipment Co., San Francisco, has acquired the assets of California Oxygen Co., California Liquid Oxygen Co., California Medical Oxygen Co., California Oxygen Co. of Salinas, California Oxygen Co. of Los Angeles, and California Oxygen Co. of San Diego. The acquisition included two liquid oxygen plants in Sacramento and La Habra, Calif.

Selas Corp. of America, Dresher, Pa., has established a district office at 1901 W. Eighth St., Los Angeles 57, Calif. It will be headquarters for sales representatives Stuart A. Whitehurst and Raymond J. Kenard Jr., who will represent Selas in California, Utah, Arizona, and Nevada.

Shell Equipment Co., Connellsville, Pa., has been named exclusive national sales and service representative for Shell-O-Matic Inc., Irvington, N. J., manufacturer of shell molding and shell bonding equipment, and Shallway Muller Corp., Cambridge, N. Y., manufacturer of sand coating mullers.

Industrial Heating Equipment Association Inc., Washington, reports that March orders for industrial furnaces totaled $2,871,000, a drop of 68 per cent from new business in the same month last year. First-quarter 1958 sales amounted to $9,603,000, 38 per cent of 1957 first-quarter volume.

Century Electric Co., 18th and Pine Streets, St. Louis 3, Mo., has built and is operating new office-warehouses at 16115 Puritas Ave., Cleveland 35, Ohio, and at 7 Commercial Ave., Fairview, N. J.

Sterling National Industries Inc. is the new name of the former Sterling Wheelbarrow Co., Milwaukee. Current plans call for no change in corporate structure or policies.

National Research Corp., Cambridge, Mass., and Leybold-Hochvakuum-Anlagen GMBH, Cologne, Germany, have negotiated a long-term cross-licensing agreement.

Two Men Make 7-Million Cores a Year with Cities Service Core Oil!

Impossible? Not for the two core makers at Indiana Brass Company! Here's the story:

Recently, this firm, famous for its brass plumbing fixtures and fittings, determined to increase core production to meet rising product demand. First step was the installation of core blowers enabling sand to be blown directly into core boxes made to produce several cores at a time. Next, Indiana decided the cores should be baked in these same boxes.

Normally, this would require boxes with vents in the sides—an impossibility when you're blowing sand into them. But Indiana thought they could bake without vents, providing they could find the right core oil.

So, for six weeks, Indiana Brass tested one core oil after another. Only one proved successful... Cities Service Delco 64 ! Nowadays, with Cities Service Delco 64, Indiana uses its core blowers, then bakes directly in the core boxes, without air vents and without problems. Moreover, they've found Cities Service Delco 64 permits extremely fast baking. Thus, core boxes can rapidly be returned for use again and less boxes are needed.

If you want an oil to speed, simplify and reduce the cost of core production, talk with a Cities Service Lubrication Engineer. Or write: Cities Service Oil Co., 20 N. Wacker Drive, Chicago 6, Illinois.

READY ... SET ... POUR! In one week, Indiana Brass recently produced 121,147 castings! "Much credit goes to Cities Service Delco Core Oil," says Indiana. "It enables us to bake cores right in their boxes!"

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

Circle 601 on Page 117

ACHESON

dispersions digest

Reporting uses for

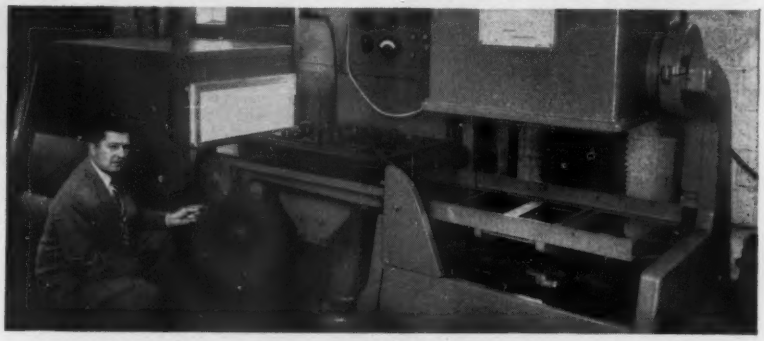
dag® BRAND DISPERSIONS

COLLOIDAL GRAPHITE, MOLY-SULFIDE, VERMICULITE, AND OTHER SOLIDS

'DAG' DISPERSIONS SHRUG OFF HEAT, KEEP PRODUCTION ROLLING

With temperatures up to 1600° F. and above being generated in various types of industrial ovens, furnaces and kilns, lubricants for bearings and other moving parts must be very carefully selected. To satisfactorily resist oxidation, heavy pressures, and reduce wear on bearing surfaces, 'dag' colloidal graphite has been accepted as having all of the properties necessary to maintenance-free performance.

Dependable bearing lubrication of pattern carriages on shell molding machines is a "must" at Production Pattern and Foundry Co., Chicopee, Massachusetts. With five shell molding machines operating three shifts a day to supply their casting floor, uninterrupted service has to be maintained. These carriages shuttle back and forth between curing ovens and investing box . . . from 900° F. to 400° F. The three friction points that require special lubrication in this operation are: axle bearings for the 4-wheel pattern carriages; the pivots for the two-hitch mounts at each end of the carriages; and the link pins of the roller chains which propel the carriages back and forth across the bed of the machine. 'Oildag' — colloidal graphite in a petroleum oil carrier — is applied once a day to the bearings and pivot points, every 12 hours to the link pins. The result: where conventional oils and greases before had decomposed leaving a tarry residue or a non-lubricating soap, 'Oildag' retained its lubricating properties under both heat and load pressures. 'Oildag' is economical and heat resistant . . . necessary characteristics to its use in this application. With regular use, lubricants containing 'dag' colloidal graphite form a low-friction graphoid film that adheres tenaciously to the bearing surface, effectively resisting rupture, oxidation, and wear. Proof of this effectiveness? Life of these bearing segments now runs about 400 hours . . . *eight times longer than before!* According to Earl W. Jahn, President of Production Pattern and Foundry, "Until we discovered the dependable high-temperature lubrication performance provided by the Oildag mixture, we just weren't in business."



24 hours a day, at temperatures up to 900° F., Oildag provides maintenance-free lubrication of shell mold pattern carriages at Production Pattern & Foundry.

Studebaker-Packard Corporation's Foundry Department finds 'dag' No. 2404 saves on material, labor, and conveyor wear.

'dag' colloidal graphite solves conveyor lubrication for Studebaker-Packard. Their Foundry Department needed the answer to more efficient conveyor lubrication in baking ovens where operating temperatures ranged from 250° to 450° F. Heat caused gumming and partial decomposition of both the heavy greases and conventional non-graphited oils used. The residual deposit left resulted in "frozen" bearings requiring excessive down-time, as well as parts replacement.

By applying a dilution of 'dag' No. 2404—colloidal graphite in a mineral spirits carrier—on bearings, bushings, races and other critical parts, Studebaker-Packard found the ready-made solution. Application of these microscopically-fine particles was easily made through their automatic spray system. The excellent wetting action of the carrier deposited an unbroken film on all critical surfaces. The resulting dry film prevented accumulation of abrasive dust or sticky residue, allowing worthwhile savings in lubricant, labor, and conveyor wear. For further information on high temperature applications write for Bulletins 423 and 424. Address Dept. F-68.

ACHESON *Colloids Company*

PORT HURON, MICHIGAN

A division of Acheson Industries, Inc.

Also Acheson Industries (Europe) Ltd. and affiliates, London, England

50th ANNIVERSARY

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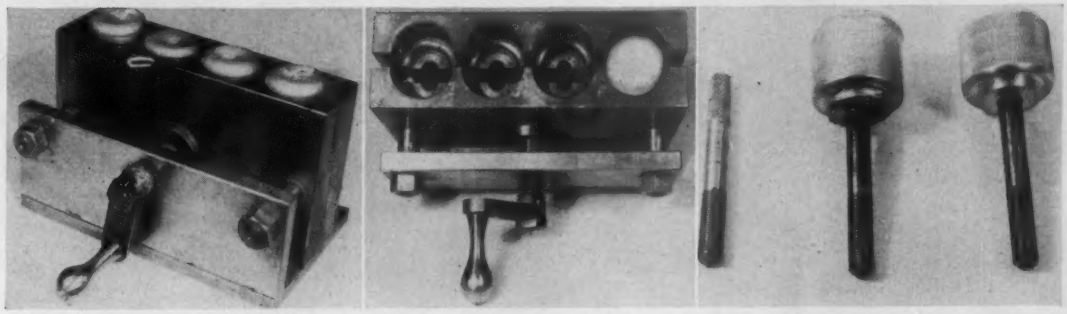
Call in your Acheson Service Engineer today.

Circle 602 on Page 117

HOW TO DO IT



Casts Aluminum Knobs onto Steel Shanks in a Permanent Mold

By H. J. GERBER
Assistant Professor
Oklahoma Agricultural & Mechanical College
Stillwater, Okla.

SIMPLE, MULTIPLE-CAVITY permanent mold is used to cast aluminum knobs onto machined steel shanks employed as adjustment screws on woodworking machines. The shanks are threaded on one end and knurled on the other. They are dropped into the mold with the knurled end protruding part way up into the mold cavity. The mold is closed with the crank and screw and the mold cavities filled with aluminum. When the aluminum has solidified, the mold is opened, tipped over to free the castings and loaded again with shanks in preparation for pouring.

After casting, the knobs are machined in a turret lathe while chucked on the steel shank. The foundry has had no report of a knob loosening from the shank in service.

Do you have any tricks of the trade tucked away with your foundry experience? Why not release them to fellow foundrymen? FOUNDRY will pay a minimum of $15 for each idea submitted and published. Send a photo or drawing with your idea

NRC made the agreement on behalf of NRC Equipment Corp., a wholly owned subsidiary. NRC owns 24 per cent of the German firm.

Pacific Car & Foundry Co., Seattle, has purchased the assets of Dart Truck Co., Kansas City, Mo., a subsidiary of Carlisle Corp., Carlisle, Pa. It will merge its Kenworth Motor Truck Div. with Dart to form KW-Dart Truck Co. in Kansas City.

American Steel Foundries, Chicago, has added $250,000 of heat treating facilities at its East Chicago, Ind., works. They will be used for the production of Wearpact alloy steel castings. Wearpact is a high-impact, high-hardness steel used in the mining and construction fields.

Hydro-Line Mfg. Co., Rockford, Ill., has appointed two new representatives for its air and hydraulic cylinders. They are H. R. Taylor & Co., 2930 E. Kessler Blvd., Indianapolis 20, Ind., for all of Indiana except Gary, and Ranney Engineering, 4218 W. 63rd St., Chicago 29, Ill., for Chicago, Gary, and northeastern Illinois.

WaiMet Alloys Co., Detroit, and **Allvac Metals Co.**, Monroe, N. C., have signed an exclusive sales agreement for the sale of vacuum-melted alloys to the foundry industry. WaiMet is a division of Consolidated Foundries & Mfg. Corp. Roger Metzler, WaiMet sales manager, will be in charge of market development.

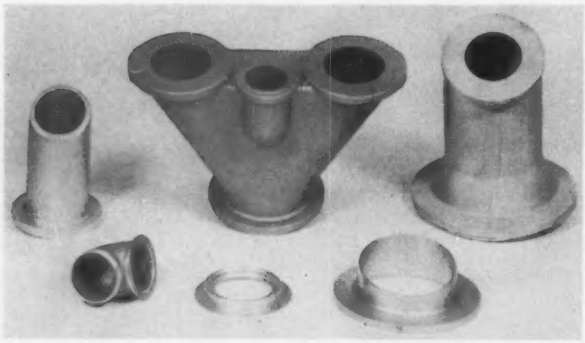
Ingersoll Products Div., Borg-Warner Corp., Chicago, has changed the name of its former Industrial Crane & Hoist operation to Borg-Warner Industrial Cranes. The change was made to identify Borg-Warner more closely with the material handling field.

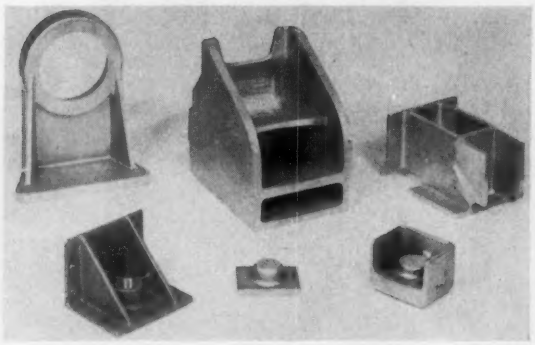
J. I. Case Co., Racine, Wis., has formed a separate department to handle sales of its Utility wheel and crawler tractor line. William J. Schlapman heads the new sales operation, and W. H. Vogel is assistant sales manager. Both formerly were associated with Wagner Iron Works, Milwaukee.

Borg-Warner Industrial Cranes, Chicago, recently has appointed Rex Bircket & Co. to be its authorized agent in the Tulsa, Okla., area, and Machine Tools Inc., with offices in Des Moines, Iowa, and Omaha, Neb., to be its agent in Iowa and Nebraska.

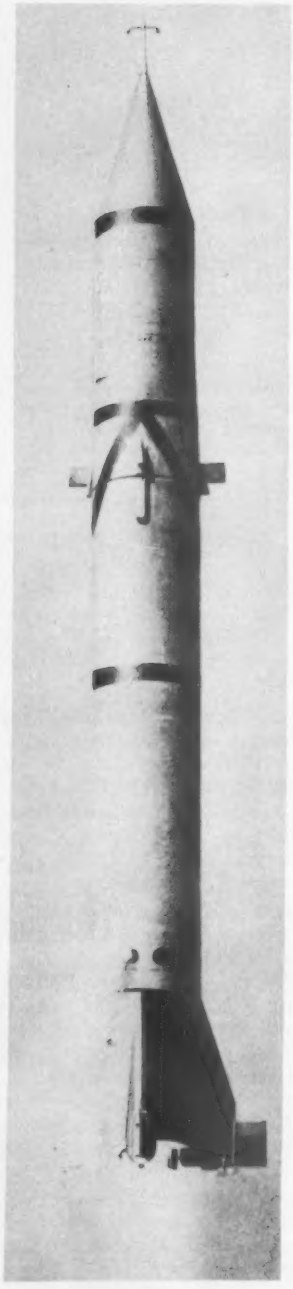
Cooper-Bessemer Corp., Mt. Vernon, Ohio, has appointed C & R Sales Co., 4500 Euclid Ave., Cleveland, Ohio, to handle engineering, application, and sale of its industrial air compressors and soot blowers in northeastern Ohio.

Metal Treating Institute members report billings in March, 1958, totaling $2,495,400, a 31 per cent decrease from the March, 1957, total. Billings for the first quarter are 27 per cent below those for the same period last year.





Group of aluminum alloy 356-T71 Redstone missile castings is shown at left. At right are Redstone castings produced in aluminum alloy 220-T4



ALUMINUM MISSILE CASTINGS

Require Strict Production Control

By ROBERT H. HERRMANN
Associate Editor

FOURTEEN high quality aluminum parts cast by Wellman Bronze & Aluminum Co., Cleveland, played a part in work leading up to the successful launching of the first American satellite. Wellman makes these 14 castings for the Redstone missile which is closely allied to the Jupiter-C rocket which put that satellite, Explorer I, into orbit.

The castings are machined at Bunell Machine & Tool Co., Cleveland, then shipped to Reynolds Metals Co., Sheffield, Ala., for fabrication into sections of the Redstone missile. The assemblies then are sent to Chrysler Corp., the prime contractor on these missiles for the Army Ballistic Missile Agency at Huntsville, Ala.

Production of missile castings at Wellman is the culmination of a trend to production of better-than-average castings. During World War II, Wellman became involved heavily in the production of high quality aluminum and magnesium aircraft frame and engine parts. Production of parts of that type accelerated the foundry's internal standards and production control program. At present the majority of castings made at Wellman is used in the aircraft industry.

Quality Control Is Strict — Dimensional accuracy, metallurgy, and casting soundness are considerably more critical for missile parts than for aircraft castings. Accordingly, missile castings are produced within strict quality control limits.

Wellman casts missile parts in green sand molds made with metal pattern equipment. In most cases a facing sand is used to obtain fine surface finishes. A typical facing mixture consists of an AFS 150 washed and dried McConnellsville sand blended with 5 per cent southern bentonite, ½ per cent cereal and 2.5 to 3.2 per cent water. Moisture is held to this low level to reduce gas formation.

Shown at left in flight is the Redstone missile. It is closely allied to the Jupiter-C rocket which launched the first American satellite

Operator tests sample of molten aluminum under vacuum for gas content prior to pouring a heat

Part of the quality control program includes quick, nondestructive inspection of castings by fluorescent penetrant-black light methods

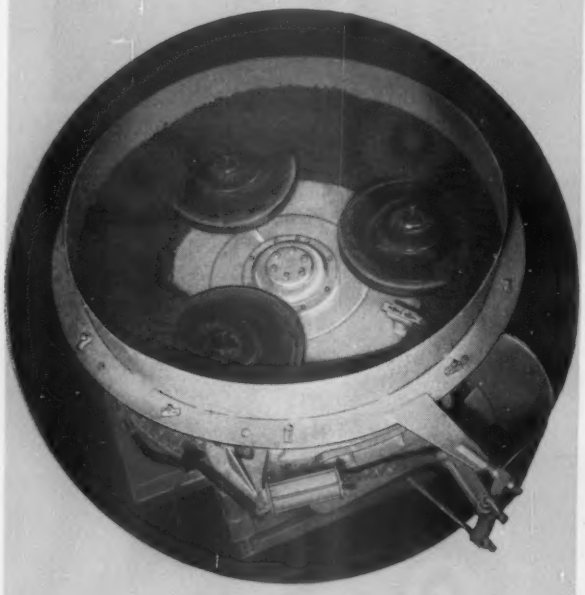
Molds are backed up with heap sand. Either sodium silicate or conventional oil-bonded cores are used.

The castings are produced in aluminum alloys 220-T4 or 356-T71. Typical heat treated metal properties of the former are 14 per cent elongation, 25,000 psi yield strength, and 46,000 psi tensile strength. Typical heat treated metal properties for 356-T71 are 3.5 per cent elongation, 21,000 psi yield strength, and 28,000 psi tensile strength. The fourteen castings for the Redstone range in weight from ½ to 11 lb. Dimensions range from 1 to 10 in.

Soundness of missile castings must approach perfection. They are radiographed as extensively as possible to Reynolds standards, which require that the castings be substantially free of discrepancies. In addition to the original radiographs, a second set of films is required of the parts after they have been machined. Film densities for both

Additional control procedures include 100 per cent x-ray inspection of castings before and after machining, using the same photographic angles

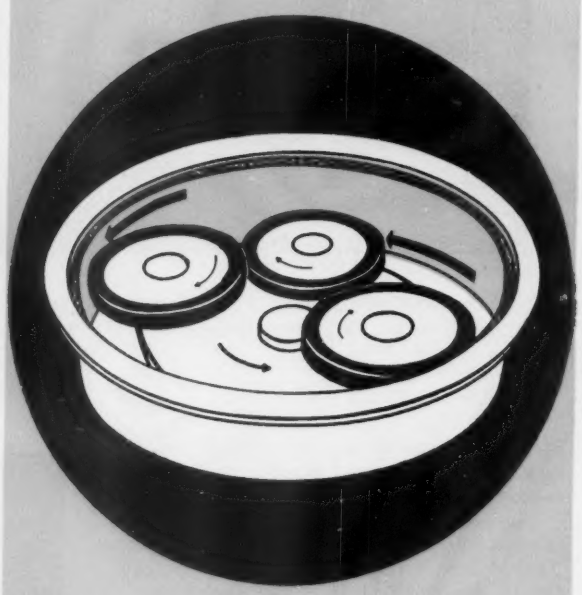
50% MORE HOURLY CAPACITY FOR LESS MONEY...



"AERATION AND COOLING IN THE MULLOR"

Our "slow" mixer had always required an external aerator . . . that meant an additional investment and additional maintenance, too. We saw that Speedmullor mulling in suspension actually provides more thorough aeration than could ever be accomplished by a separate aerator. Most foundries reported that their sand was up to 25% lighter in weight per cubic foot on discharge from a Speedmullor . . . that's real aeration.

Speedmullor Cooling offers a real advantage, too. We mull hot shakeout sand and it has to be cooled before use. With Speedmullor Cooling we can force cooling air right through the sand and accomplish real cooling *in* the mullor . . . that eliminates an expensive external cooling unit.



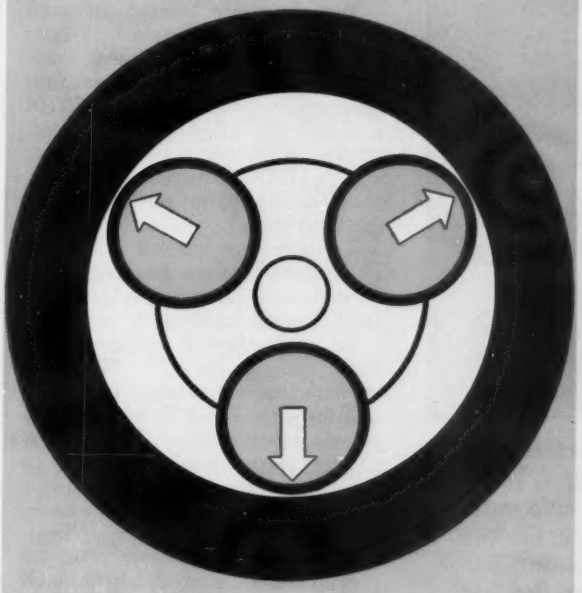
"REAL CAPACITY PLUS MAXIMUM MULLING"

We found that there was no mystery to the output advantage of Speedmullors. We had known that mulling was merely the application of work energy to the sand mixture to obtain a squeezing and kneading, coating action. The work has to be applied as pressure over an area of sand. Speedmullors utilize centrifugal force to apply even greater pressure than the heavy mulling wheels of a "slow" mixer. Yet, the mulling wheels of a Model "80A" Speedmullor cover three times the area covered by the slow moving wheels of the largest conventional mixer. The result is over three times the mulling.

In our "slow" mixer there's a lot of slippage, too. Sometimes the big steel wheels just slide around instead of rotating. With Speedmullor rubber-to-rubber mulling, there can be no slippage . . . and there's better mulling with rubber, too.

. . . that's why we bought SPEEDMULLOR*

Our mulled sand requirements had increased steadily, until our conventional "slow" muller just couldn't keep up, *and* provide the quality we needed, too. When the time came for its replacement, we figured we would have to install two new mullers. That's when we decided to investigate Speedmullors, although some of our "old timers," accustomed to "slow" mixing for so long, were hesitant. We thoroughly checked Speedmullor users on their performance and capacity, and that's when we really got interested.



"CENTRIFUGAL FORCE SPEEDS DISCHARGE"

The time required for discharge in our "slow" muller (25 to 35 seconds) had always seemed long and wasteful. There's no mulling accomplished during discharge and a slow discharge really cuts into capacity. The Speedmullor uses centrifugal force to discharge the sand, too . . . and it's really fast. A complete, thorough discharge requires only 7 to 11 seconds in the Speedmullor. Faster mulling and faster discharge add up to lower power cost . . . even with the more powerful Speedmullor. My car is more powerful today than was one thirty years ago, but it sure goes a lot farther on a gallon of gas.

"THERE'S NO MYSTERY TO MULLING"

We learned that Speedmullor mulling *fully* develops physical properties in mulling cycles less than one-third as long as in our conventional muller. With over three times as many batches per hour, the Speedmullor more than offsets the larger batch size of our conventional mixer. In fact, an "80A" Speedmullor provides more than 50% greater *hourly* capacity of fully mulled sand than the largest size conventional mixer . . . and would meet our capacity needs at lower cost.

***One of 863 foundries that have *replaced* conventional "slow" mixers with Speedmullors.**

902 foundries have placed repeat orders for Speedmullors. One single foundry has 39 Speedmullors in operation, and one single company has 72 Speedmullors in operation.

TODAY, MORE FOUNDRY SAND IS MULLED IN SPEEDMULLORS THAN IN ANY OTHER MULLERS

PROGRESSIVE FOUNDRIES LOOK TO
BEARDSLEY & PIPER
FOREMOST DEVELOPER OF FOUNDRY MACHINERY

MEMBER FEMA

BEARDSLEY & PIPER—DIV. PETTIBONE MULLIKEN CORP.
2424 N. Cicero Avenue, Chicago 39, Ill.
SEND FOR NEW BULLETIN TODAY

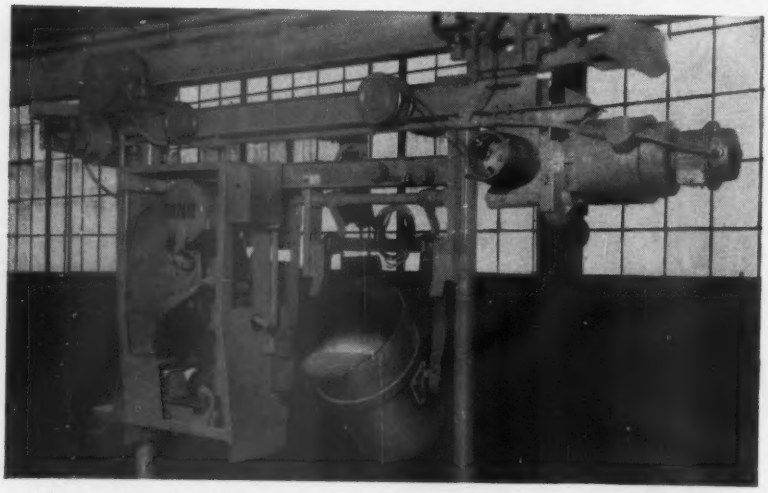
Circle 603 on Page 117

SHEPARD NILES

HOT METAL CARRIER

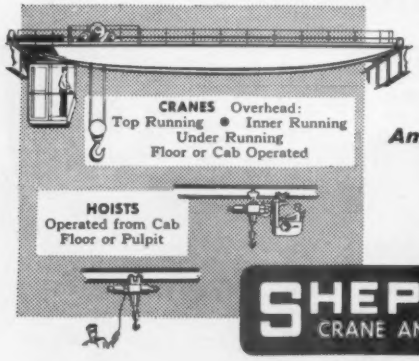
MOVE HOT METAL

the safe, swift, economical way



Shepard Niles hot metal carriers efficiently move molten metal safely and swiftly from cupola to pouring line. These rugged, modern carriers cut handling costs and save manpower by enabling ONE man to transport and pour molten metal. You can be certain of fast precision pouring because the operator cab is on the same level as the hot metal being poured.

Mechanize your foundry for labor-saving, low cost handling of molten metal. Send for the Hot Metal Carrier bulletin . . . or ask that a Shepard Niles representative call — there's NO OBLIGATION.



Building
America's Most Complete Line of Cranes and Hoists Since 1903

SHEPARD NILES
CRANE AND HOIST CORPORATION

1382 Schuyler Ave., Montour Falls, N. Y.

the castings and the machined parts are in the range of 1.5-2.5.

The Control Program—First step in Wellman's rigid quality control program is to take a small cup of degassed alloy from the furnace and place it under a bell jar from which air is exhausted. After 7 minutes the solidified sample is removed, quenched in water, sawed in half, and the cut surface filed and examined under a magnifying glass. If gas holes are detected, the melt is degassed further.

In the meantime spectrographic analysis discs 2½ in. in diam, ¼ in. thick are poured in a steel mold. Spectrographic results are checked by chemical analysis of millings from the same sample.

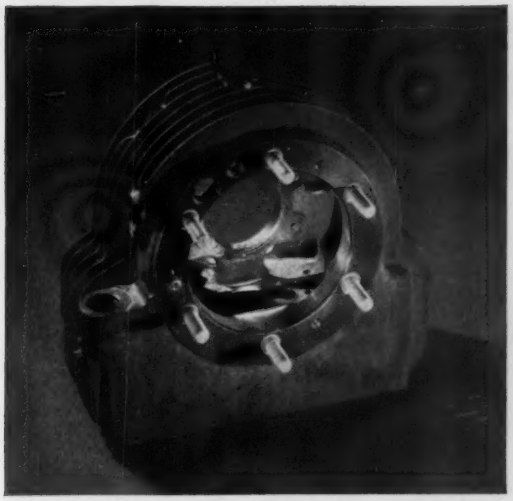
Pour Test Bars in Sand

Test bars are poured in sand molds at the same time that castings are poured and are heat treated with the castings they represent. Solution treatment of the 220-T4 and 356-T71 alloy castings is performed in electric furnaces according to federal specifications. Alloy 356-T71 parts are aged in a gas-fired oven.

To determine whether a satisfactory heat-treatment has been performed, each casting is subjected to three Brinell hardness tests. Minimum average Brinell hardness of the three readings for alloy 220-T4 is 70 with no one reading below 68, and for alloy 356-T71 it is 60 with no one reading below 56. Castings in the proper hardness range go through a finish cleaning operation. Castings are checked dimensionally both before and after heat-treatment. Visual inspection is continuous from shakeout through shipment.

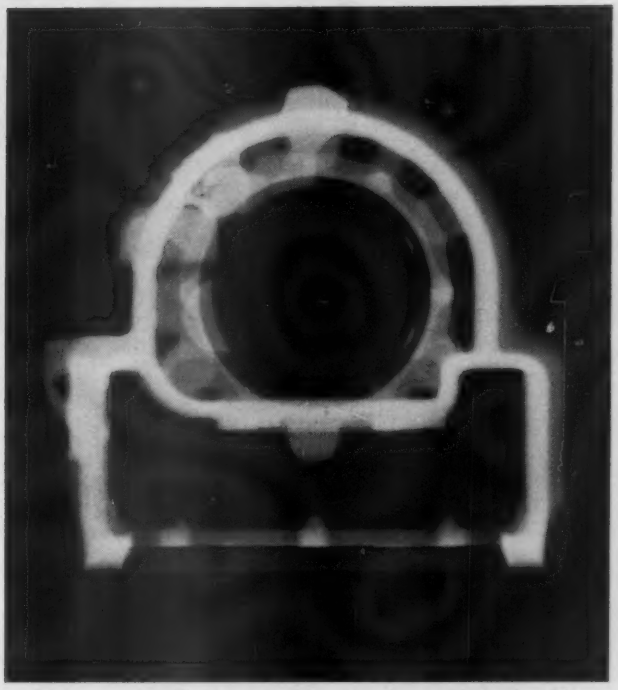
Following the dimensional inspection, the castings are examined by fluorescent penetrant inpection methods. A 100 per cent x-ray operation is the last inspection procedure performed.

Completed castings are shipped out for machining and returned to the foundry for final x-ray inspection. Machined castings are x-rayed from the same angles as used in the previous examination. Approved, machined parts finally are returned to the machine shop with all pertinent data, x-ray films, and test specimens to be packed and shipped to Reynolds Metals where missile sections are assembled. Reynolds Metals machines tensile test specimens from a percentage of castings from each heat. Tensile properties then are obtained from both the separately cast bars sup-



Shrink caused leakage...

Radiography showed how to correct it



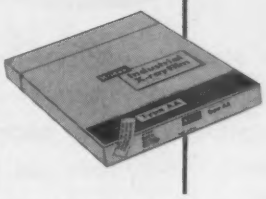
Radiograph of rough casting for air turbine-driven power supply gear housing.

This casting is the gear housing of a vital air turbine-driven power supply produced for the Utica Division of Bendix Aviation Corp. for use in jet-age aircraft. It must operate at temperatures up to 300°F with utmost dependability.

Seepage of oil through the shell was a recurring problem. And this is where radiography came in with a double-barreled assist. First, radiographic examination of the rough castings provided information to help determine whether the castings would prove acceptable when machined — *before* more than 150 machining operations were performed. Second, the radiographs revealed the cause of the difficulty—internal shrinkage—and disclosed a recurring pattern which led to placing chills so as to overcome it.

Result: a critical part became a routine production item with substantial savings in time and costs to both foundry and manufacturer.

If you would like to know how radiography can improve your own operations, talk it over with your x-ray dealer—or the Kodak technical representative.



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plied by the foundry and the machined test specimens. Both the separately cast bars and the machined test specimens must meet federal specifications.

Investment Casters To Meet In Muskegon, Mich., in June

Members of the Investment Casting Institute will meet in Muskegon, Mich., June 23-25, 1958, for their annual technical session. The three-day program is designed for key executives of member companies and their technical staffs. It includes plant visitations and panel discussions as well as presentation of technical papers.

Details of the program follow:

Monday, June 23

8:20 a.m.-12 noon—Special plant visits.
12:30 p.m.—Luncheon.
1:30-4:30 p.m.—Committee meetings.
5:30 p.m.—Affiliates reception.
9 p.m.—**Problems in Making Castings at a Profit** (general discussion).

Tuesday, June 24

8:30 a.m.—Film: **Pointing the Way.**
9 a.m.—Introductory remarks: Dr. R. A. Flinn, University of Michigan. Technical sessions: **Pressure Poured Precision Castings in Graphite Molds,** Dr. Flinn. **Future of Investment Castings in Airframes and Missiles,** John Dietz, Chance-Vought Aircraft Inc., Dallas, Tex. **Casting Design for the Ultimate in Load Carrying Ability,** John Caine, Cincinnati. **European Investment Casting Techniques,** R. F. Waindle, WalMet Engineering Co.
1:45 p.m.—Technical sessions: **Future of Vacuum Alloys—Anticipated Fields of Endeavor,** F. S. Badger and W. H. Hunter, Haynes Stellite Co., Kokomo, Ind., and roundtable discussion. Panel Presentation: **Quoting for Profit, a Cost Estimating Program:** K. J. Yonker, moderator; E. G. Chapman; N. Lirones; B. Paddock; S. H. Davis; W. C. Cribbs—all of Misco Precision Casting Co., Whitehall, Mich.
5:30—Reception and dinner.

Wednesday, June 25

9 a.m.—Technical sessions: **Problems and Techniques — Dipcoat and Investments:** Panel presentation: C. R. Whittemore, Deloro Smelting & Refining Co., moderator; C. W. Schwartz, Misco Precision Casting Co.; T. E. Moore, Ransom & Randolph Co.; R. T. Carter, Hitchiner Mfg. Co.; Irving Malkin, Precision Metalsmiths Inc. **Fundamental Aspects of Ceramic Shells for Precision Casting,** Karl Scheffer, General Electric Co. **Progress in Development of a Ceramic Shell,** Dr. J. Keverian, General Electric Co., moderator; Dr. Raymond Reuter, National Aluminate Corp.; and J. D. Pisula, Cohart Refractories Co.

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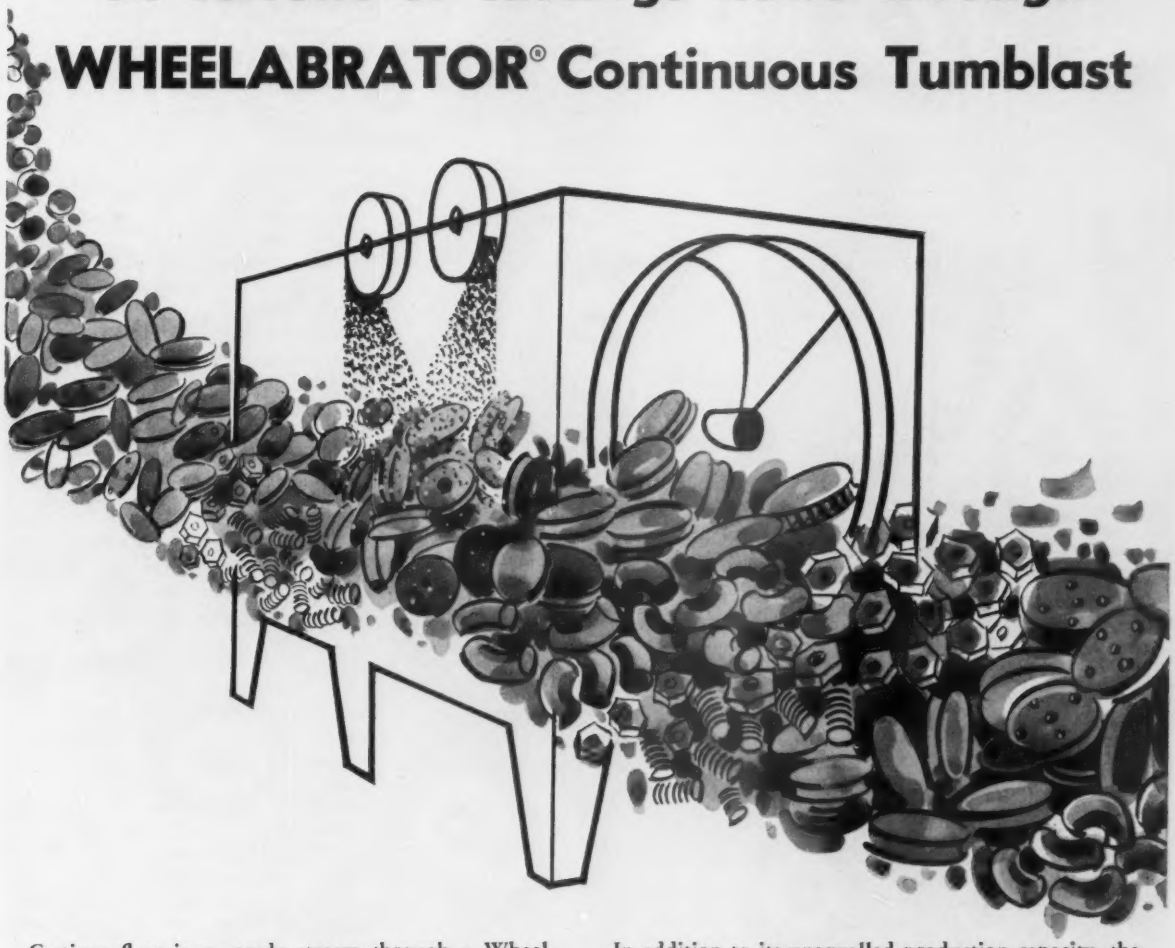
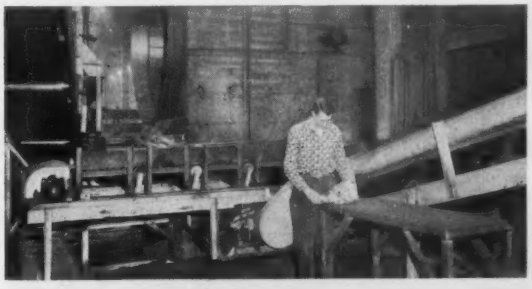
AT SCORES OF HIGH PRODUCTION FOUNDRIES

A torrent of castings flows through WHEELABRATOR® Continuous Tumblast



Castings flow in a steady stream through a Wheelabrator Continuous Tumblast, without interruptions for starting and stopping, loading and unloading. Because of this continuous flow, the Continuous Tumblast can be integrated into a production line, providing a production speed geared to any need.



In addition to its unequalled production capacity, the Continuous Tumblast is highly automated. It maintains steady production without the attention of an operator, adding substantial savings in materials handling costs to its great savings through low-cost airless blast cleaning.

At the Ohio foundry of a prominent automotive manufacturer, for example, a Wheelabrator Continuous Tumblast functions as part of an automated processing line. Castings flow on belt conveyor into the Wheelabrator, pass through the abrasive blast, and are conveyed on to machining operations.

Production rate varies according to types of castings being cleaned. However, an average of approximately 15 tons hourly is being maintained.

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For detailed information on the Continuous Tumblast, write today for Bulletin 110-D.

WORLD'S LARGEST MANUFACTURERS OF AIRLESS BLAST CLEANING EQUIPMENT AND STEEL ABRASIVES

Foundry Developments

By EDWIN BREMER
Metallurgical Editor

USING type 356 aluminum alloy, the vacuum degassing technique for eliminating porosity was compared with the nitrogen degassing method at Frankford Arsenal. Described in "The Effect of Nitrogen and Vacuum Degassing on the Properties of a Cast Aluminum-silicon-magnesium Alloy (Type 356)" by Owens, Antes, and Edelman, it was found that more hydrogen was removed by nitrogen degassing for a given degassing time, but the degassing time to produce completely sound metal was the same for both methods. Tensile properties of the alloy were insensitive to the method of degassing. Virgin and remelted heats were tested. The report designated PB 131351 is available from the Office of Technical Services, U. S. Department of Commerce, Wahsington 25, for 75 cents.

Close Tolerances

NEW MOLDING process aimed at production of precision castings has been developed by Swayne, Robinson & Co., Richmond, Ind. Called "Azcast," the method employs the CO_2 molding process, and it is claimed that dimensional tolerances are held within plus or minus 0.015 in. per in. Molds are hardened on the patterns, and the application will be mainly to castings requiring close tolerances for machining.

Radiation Detection

GREATER use of radioactive materials in medicine and industry has brought about increased awareness of need for radiation detection and safeguards against exposure of personnel. Integral part of the detection-protection problem is a technique of measuring high-energy radiation dosage by use of photographic emulsions as the recording medium which is termed photographic dosimetry. It makes use of small badge-like packets containing one or more types of film selected to cover a certain range of radiation dosage. Film types may be chosen to record either a wide or narrow range of radiation dosage. A 14-page technical booklet (A-1009a) describing seven types of dosimeter films, useful exposure ranges, processing, and calibration, as well as a bibliography on dosimeter film usage, is available from Du Pont Co., Room N-2420-2, Wilmington 98, Del.

Cobalt Data

INFORMATION on cobalt is available in several reports issued by Cobalt Information Center, Columbus, Ohio. One is "Cobalt in High-Temperature Alloys" by Dr. F. R. Morral which reviews needs of industry, areas requiring further research, production, consumption, properties of cobalt and cobalt alloys, etc. Others are literature and patent reference lists on "Aluminum-Cobalt Alloys," "Cobalt in Cast Iron," and "Cobalt in Stainless Steel."

Statistical Aids

TWO MANUALS prepared under Armed Forces sponsorship to aid engineers and scientists in use of statistical procedures in research and development now are available from the Office of Technical Services, U. S. Department of Commerce, Washington 25. One is *Statistics Manual* by E. L. Crow, F. A. Davis and M. W. Maxfield and contains 299 pages. It is designated PB 131483, and the price is $6. The other is *Tables of the Error Function and of its First Twenty Derivatives* and contains 302 pages. It is designated PB 131464, and the price is $2.50.

Resistant to Wear

IDEAL wear-resistant alloy for tomorrow's all-aluminum automotive engine, according to the Aluminum Co. of America, may be the familiar but rarely used 20 per cent silicon type. Difficulty in machining the extremely hard composition made its use impractical, but recently developed foundry techniques in combination with improved cutting tools now make it possible to cast and machine the super-hard alloy with comparative ease. Low expansion and high wear-resistant qualities make it attractive for an all-aluminum auto engine. Cylinder wall surfaces are characterized by hard silicon crystals separated by aluminum pockets which being porous, act as oil reservoirs.

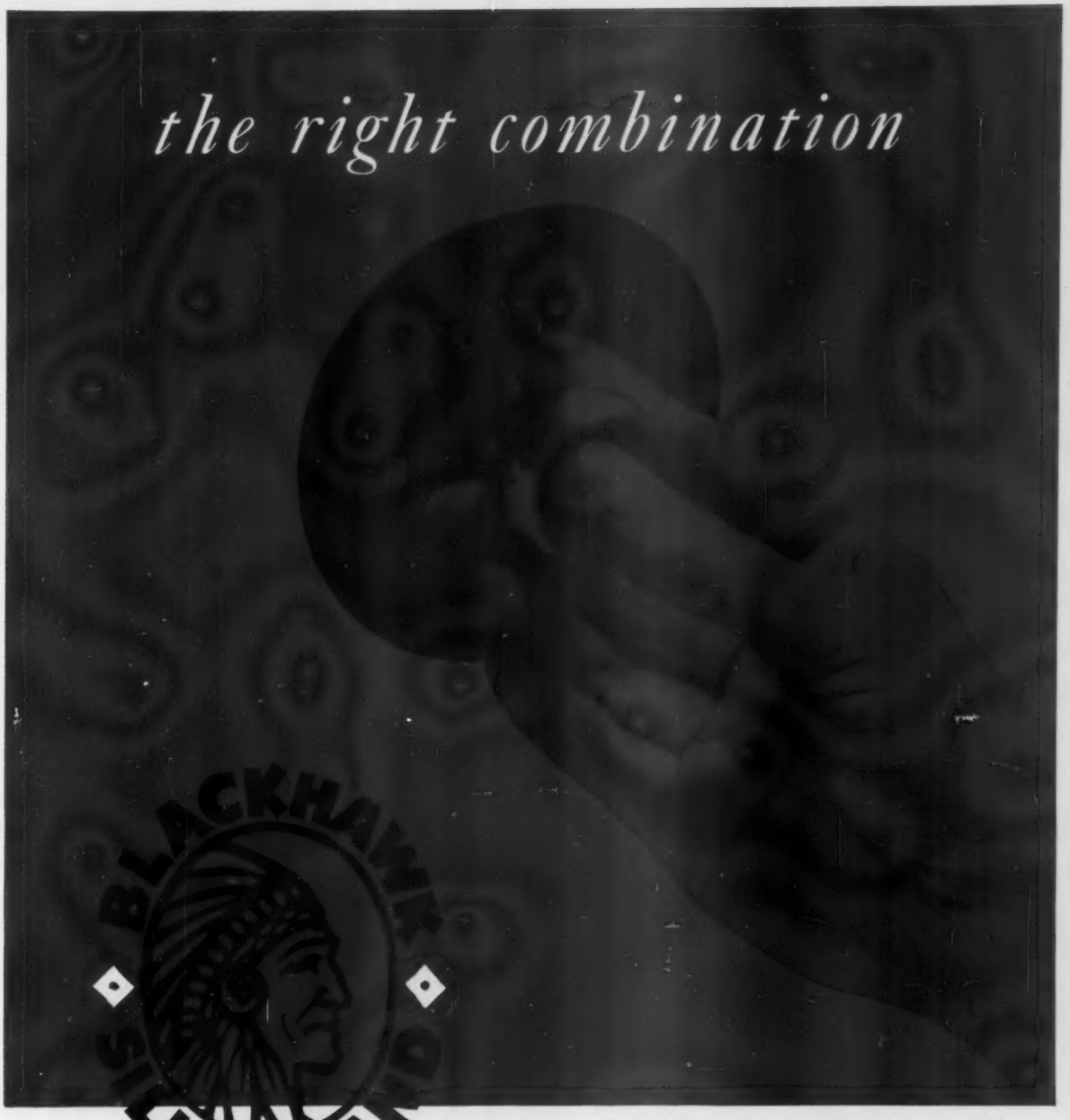
Increased Purity

REFINEMENTS in production techniques are reported to have enabled Electro Metallurgical Co. Division, Union Carbide Corp., to increase the purity of its columbium (niobium) metal to 99.6 per cent. Oxygen and nitrogen contents have been reduced as indicated by the following composition specifications: Oxygen 0.10 per cent max, nitrogen 0.04 per cent max, carbon 0.05 per cent max, tantalum 0.15 per cent max, titanium 0.01 per cent max, iron 0.01 per cent max, silicon 0.01 per cent max, boron 0.0001 per cent max, and columbium remainder. Metal is available as roundels, pressed electrode segments for arc melting, and ingots.

Limits Chromium Coat

Magnetic particle inspection is used to detect hidden cracks in high-strength steels during and after chromium plating, but sensitivity of this crack-detection test decreases as the plating thickness increases. Study of the problem at Wright Air Development Center established that a chromium plating thickness of 4.5 mils was the practical limitation for effective crack detection. Depth of crack is the controlling factor, and crack width has little effect. Details are available in "Effective Thickness of Chromium Plate on Sensitivity of Magnetic Particle Inspection," by W. Steindorf and B. Cohen which is designated report PB 131608. It may be obtained from the Office of Technical Services, U. S. Department of Commerce, Washington 25, for 50 cents.

the right combination



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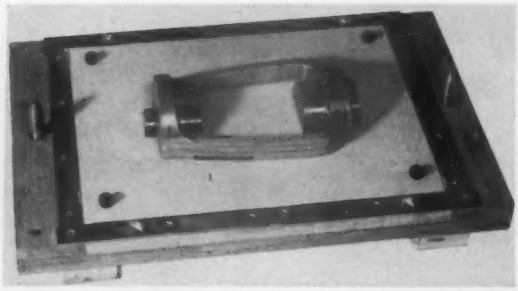
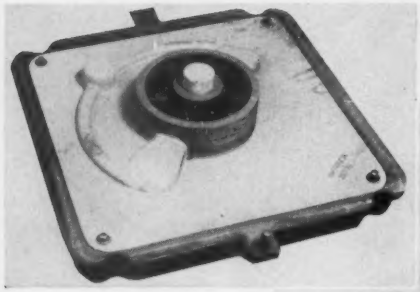
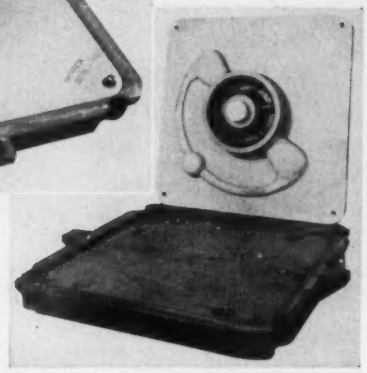


Plywood insert board is fastened to mahogany master frame. Note Allen-head socket cap screws and metal wear strips for flask rest



Machined metal master frame ready for molding machine. Plywood insert board is fastened with four Allen-head socket cap screws



Metal master frame with plywood insert board in a vertical position ready for fastening to frame

Insert Boards are Key to

LOWER PRODUCTION COSTS

By **HAROLD BROWN**
Metallurgical Associates Inc.
New York
and
ROSMOND MACDONALD
Hunt-Spiller Mfg. Corp.
Boston

LITTLE is available in the literature about the use of insert boards, although they can enable foundrymen to reduce production substantially. This technique is, however, attracting increased attention. It can do these things:

1. Reduce mounting costs more than 70 per cent for production runs of 5 to 1000 pieces.
2. Provide uniformity and accuracy on short-run jobs instead of the inherent inaccuracies caused by loose patterns ordinarily used for this type of work.
3. Act as a powerful merchandising tool to procure new customers when legitimate reductions in casting costs are demonstrated to them through insert board use.
4. Substantially reduce pattern storage area required for regular mounted work by over 50 per cent.

The insert board is simply an inexpensive piece of plywood to hold the pattern. It fits inside a more rugged frame on which the flask rests. The inserts are held in place by four fast-operating screws which allow pattern changes to be made in minimum time for short-run work. Experience has shown that as many as 20 changes can be made in a routine manner during a normal working day. The average changeover time is less than a minute.

There are no secrets to the insert board method, but many technical problems are encountered in the development of an individual setup for a particular foundry. In the writers' own experience, it took approximately a year of concentrated effort and time to develop the system. But, with advanced knowledge of the technical difficulties likely to be encountered, this same system can be set up in any foundry, regardless of size, in a matter of 4 to 6 weeks at a very reasonable cost.

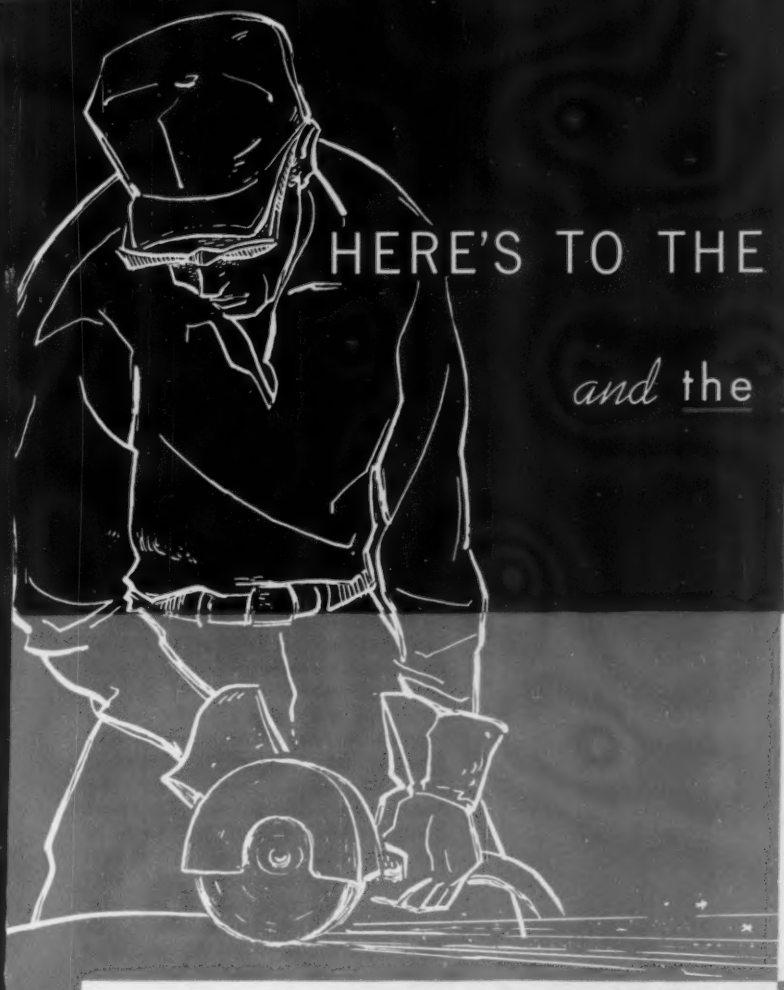
We will atempt to describe the general procedures followed in the installation of an insert board system in a given foundry. It is to be noted, however, that utilization of outside technical help which is experienced in these procedures can minimize substantially the number of problems and the amount of expense likely to be incurred by tackling the job in any other manner.

Select the Method—The first step in developing a system is the selection of the method to be used in registering the insert board in the master frame and the matching of the two boards. There are a number of methods of accomplishing this step.

In some instances, two edges of the board are used as the basis of reference. Other procedures include the use of corebox dowels, matching holes drilled in the two boards, and the installation of properly indexed, machined plates. Each foundry must determine that method which offers it optimum value on the basis of existing facilities and type of work.

Once the method has been determined, it is impractical to change procedures. After a number of patterns have been mounted in a particular way, any change would make this work obsolete and result in needless expenditure.

In the two-edge board method, the edges are used to determine the centerline on which the pattern is mounted. These edges must be square and perpendicular. When corebox dowels are employed, the female dowel is used in the plywood insert, and the male dowel is in the master frame. This method usually requires a drill jig to place the dowels in the insert to line up accurately with the master frame. The third method, the use of two drilled holes in each board, locates the insert board by locating these holes on the two pins in each master board. This method also requires an accurate drill jig for drilling the inserts. The fourth common method is the use of two machined plates in each insert.



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- "Very satisfactory cutting off valve stems."
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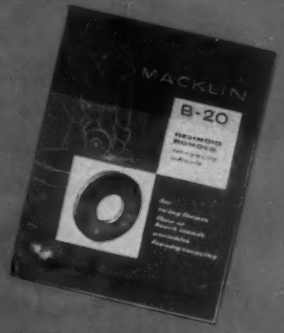

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These plates are made from 3/16 to ¼-in. steel stock. One plate has a drilled hole and the other a milled slot.

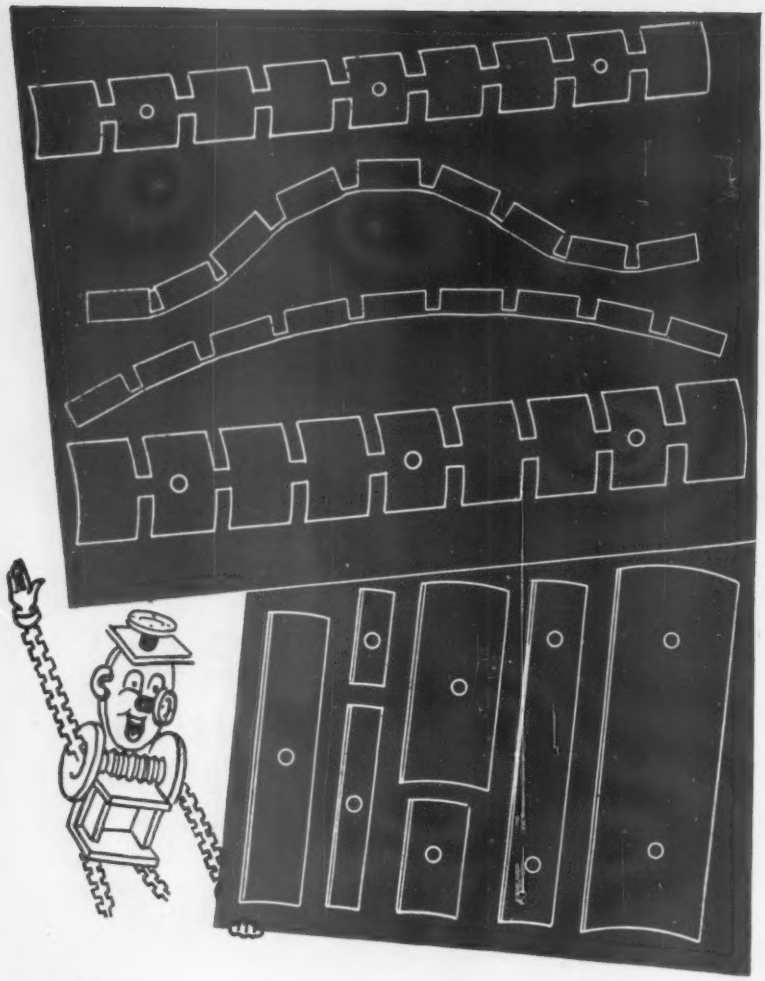
Pin Location Important—In all methods, pins or bushings are installed in the master board to locate the flask. The location of these pins in relation to the secondary pins for the insert board must be exact and must match between cope and drag master frames. Continuous steel wear-strips should be used on the master frame at the flask rests. These can be replaced as wear progresses. Tapped steel plates are provided at appropriate points to receive the hold-down bolts used to secure the insert board in the frame.

The construction of the master frame for the insert boards is equally important. Since the frame is used for many boards, it should be of rugged construction. Its cost is amortized over hundreds of pattern mounting changes, a factor which permits use of the best material and construction. Once the method gains momentum and usage, the foundry may find the use of a metal master frame desirable. One of the illustrations depicts a frame cast of nodular iron, completely machined and mounted on a jolt-squeeze strip molding machine. A machined metal frame of this type is more accurate over a longer period than a wooden frame.

Regarding the insert board itself, plywood is an ideal material for the average jobbing-type pattern. It is inexpensive and uniform in both quality and size. We recommend that only the "exterior waterproof" type be used. Grade A-C with one side free from defects is ideal for the application. The boards should be completely painted to prevent moisture absorption and possible swelling or warping.

The possible use of metal insert boards also should be considered. With proper engineering, these metal inserts can be used interchangeably with the same setup utilized for plywood inserts. The more expensive metal inserts can be justified where long production runs are anticipated or where higher accuracies are required.

Finally, the storage of insert board patterns is an advantage that should not be overlooked. These boards are relatively small and thin compared to the permanent-type boards. Because of the uniform size of the insert board, they are ideally suited for storage in racks. They require less than half the space taken up by the conventional mounted pattern.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802	817	832	847	862	877	892	907
803	818	833	848	863	878	893	908
804	819	834	849	864	879	894	909
805	820	835	850	865	880	895	910

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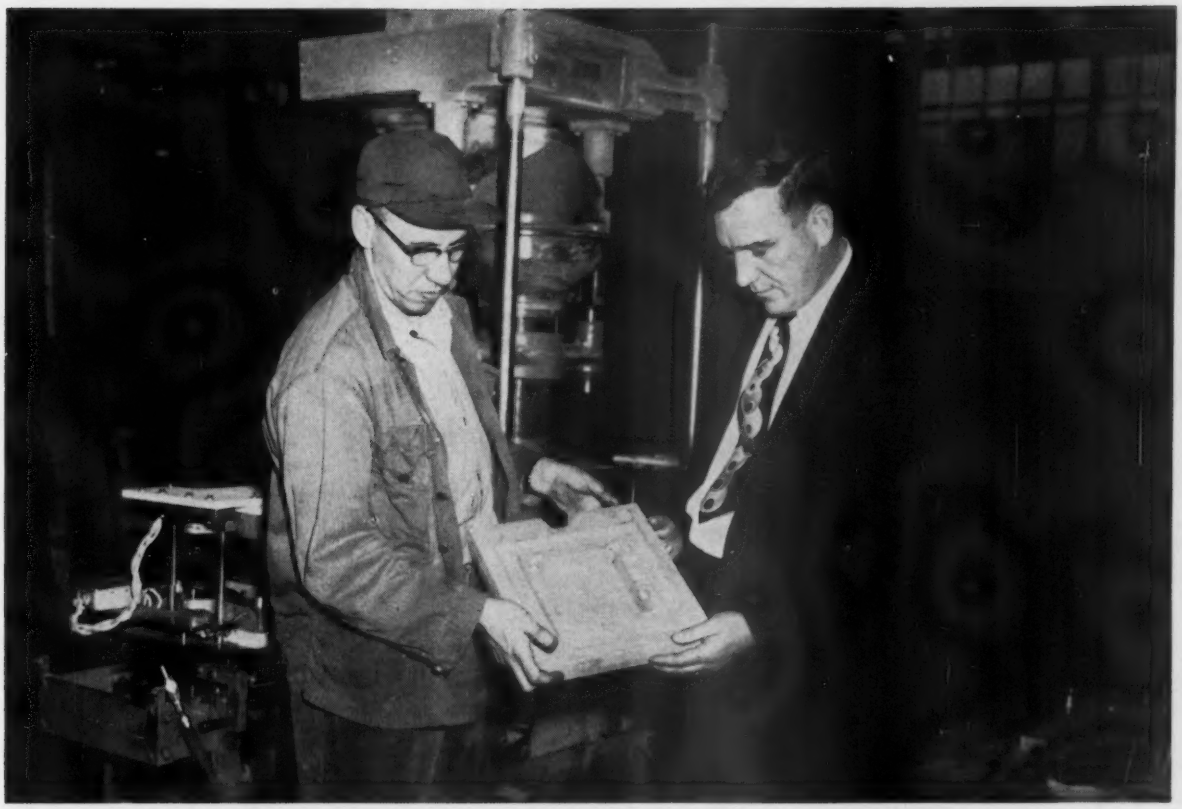


UNIFORM GRAIN STRUCTURE and smooth surface of shell mold for a fireplace cleanout door are examined by Don Smith, foundry foreman, and Lyman Pellett, plant superintendent, Bennett-Ireland, Inc.

Foundry cuts costs for customers with accurate shell mold castings

"Shell molding cuts costs for our customers—and for us," says the management of Bennett-Ireland, Inc., Norwich, N. Y.

This 50-year-old foundry took the step to shell molding after eight months of development work with Durez foundry resins.

Today, Bennett-Ireland keeps seven shell mold machines busy on parts for fireplace equipment, which they manufacture, and on castings for other firms. Bennett-Ireland still uses Durez resins exclusively.

50% saving on parts

For one customer, this foundry makes cutter and scraper blades for automatic ice-making machines. Formerly, the cutter blades were flame-cut from bar steel, then drilled. The scraper blades were produced by welding four pieces of bar steel, then machining a cutting lip.

Now Bennett-Ireland cuts this customer's parts cost in half. The accuracy of shell molding makes it possible to cast both blades, eliminating the cutting, drilling, and welding operations, and sharply reducing finishing time. The blades are cast of manganese bronze, improving corrosion resistance of the parts.

For another customer, Bennett-Ireland used to cast high-tension wire weights, using a two-impression jolt squeeze pattern in green sand. Now these grey iron castings are produced from a six-impression shell pattern, with obvious savings.

On Bennett-Ireland's own line of fireplace equipment, shell molding with Durez resins cuts the cost of andirons and other components, which formerly had to be purchased; helps produce fireplace parts with excellent detail and smooth surface requiring little finishing; and reduces parts inventory, since shell molds can be made and stored for use whenever needed.

Changeover takes time

If shell molding is in your future plans, remember that the changeover takes time and requires experience. This is where your Durez technical man can help you. He's well versed in shell molding and its application to foundry practice. He offers you a unique background of experience: a large percentage of shell molds in this country are made with Durez foundry resins.

For a better idea of the results foundrymen are getting with these resins, write us today asking to receive issues of fact-filled "Durez Shell Molding News."

DUREZ® HOOKER CHEMICALS PLASTICS

PLASTICS DIVISION

HOOKER ELECTROCHEMICAL COMPANY

1006 Walck Road, North Tonawanda, N. Y.

Circle 611 on Page 117

Man to Man

By RALPH L. LEE, *President*

Lee Hobby Foundry
Birmingham, Mich.

"Too often, folks who really are carrying the load and paying the rent never hear a word from their bosses unless things go wrong"

The Howdy Rounds

AS I go around the country, making speeches and visiting as many foundries as I can, I find most of their bosses with their hands pretty full. They're busy not so much with the problems (although there are plenty) of making the castings they have orders for, but with the need for more orders, the competition they run into trying to get them, and the presence or threat of red ink.

I don't imagine that anyone who never has had the responsibility of keeping a foundry business afloat, let alone under way, has the slightest idea of what the captain is up against, not only in stormy weather, but also in seemingly clear sailing. From my own personal experience as the president of the Lee Hobby Foundry and a close confidant of tried and proved foundry captains, it seems that just the routine job of running one of these outfits is one continuous series of emergencies, like fires to be put out, so that for the moment every other important consideration has to be shelved to keep the whole place from going up in smoke.

I find that some of these captains have plenty of intestinal fortitude. They can take all this punishment in their stride without the slightest indication of pending ulcers. Then there are others, in somewhat over their depth, who are in one continuous tizzy, dashing about from one dilemma to another, belching butterflies in constant fear of what is likely to happen next. Of course there also are bound to be some between these two extremes.

An Old Story—When I mention this observation to some of my seasoned veterans, I usually get a comment on this order: "Why, of course, Doc! What could you expect in a cantankerous business like the foundry. It always has been and always will be one damned thing after another, in good times or bad." I have also discovered, by the way, that this characteristic is not peculiar to the foundry business. Captains of other ships offer the same comments.

So I guess we can take for granted that running a foundry business is a he-man chore with plenty of punishment and that some can take it much better than others.

But what d'you say that we get out of the smoke-filled office and go out into the clean-aired shop, back to the cupolas or furnaces, the floor or loop, the core or cleaning room, the pattern shop, shipping, accounting and what have we. After all, castings aren't made in the front office. We find that the folks holding down these posts consist of about three kinds at least. First are the old standbys, who know their jobs from A to Izzard and do them day in and day out, without much fuss or help from anyone. Then there's another breed, made up of people who know their jobs all right, but who manage somehow or other to get into other people's hair and into hot water most of the time. Then there are the greenhorns, with hearts of gold (maybe) who don't know their seats from a hole in the ground. All of these folks, regardless of category, are necessary, or at least should be.

"Howdy!"

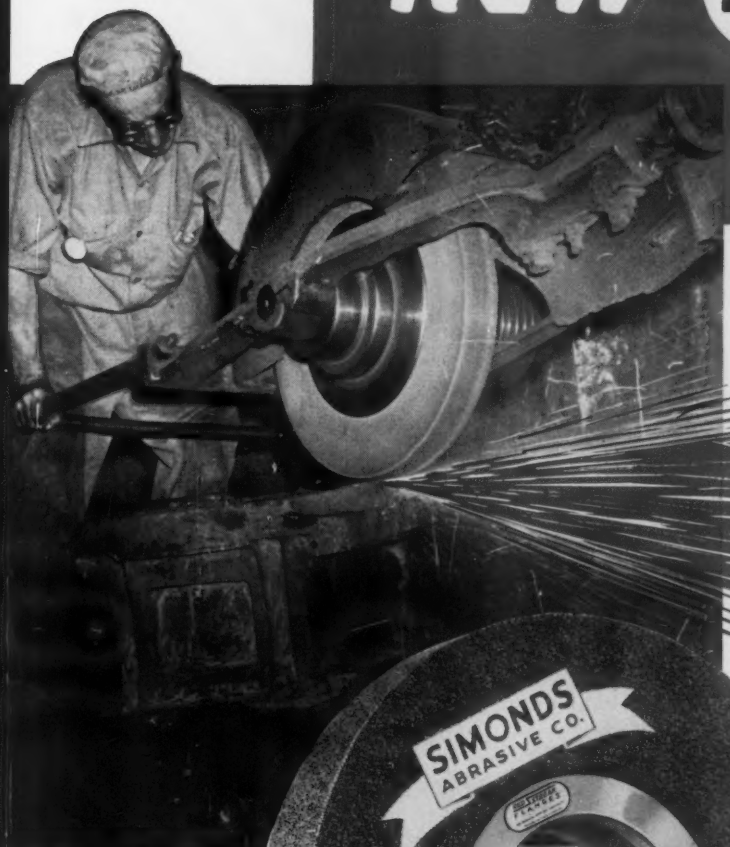
Now then, one of these bosses, with the weight of all creation on his shoulders, dashing about putting out fires, is more than likely to spend most, if not all, of his time, with the class two and three types who are starting the fires. In the meantime, the class-one type, who is carrying on the bread and butter work, never sees hide nor hair of the boss. Believe you me, I have found this situation all over the country. Too often, folks who really are carrying the load and paying the rent never hear a word from their bosses except once in a blue moon when something goes wrong —never when things go right.

The Personal Touch—We certainly don't need a blueprint for this all too prevalent situation, nor need we be psychologists, moralists, or philosophers to realize that no one possibly can measure up to his capacity or maintain it without some form of regular personal recognition. Even a bawling out is better than being ignored.

If I could wave a magic wand or polish a lamp for the fulfillment of my dearest wish for the well being of this grand old foundry business of ours, here's what it would be:

SIMONDS
ABRASIVE CO.

NEW IL BOND
Snagging Wheels



MAKING SMOOTH GOING OF ROUGH GRINDING

For rough snagging on swing frame, floor stands and portable grinders.

The life of a hard grade, plus the fast free-cutting of a soft grade! Every Simonds wheel made with new IL Bond has this ideal combination — because of the unique internal lubricating action of this new Bond — another Simonds improvement to bring you the best in grinding wheel performance. Write for Snagging bulletin ESA 62.

INDUSTRIAL DISTRIBUTORS
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CALL YOUR SIMONDS DISTRIBUTOR

Proven products
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Quick supply

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Tacony & Fraley Sts., Philadelphia 37, Pa.
Division of Simonds Saw and Steel Co.
BRANCHES: Philadelphia • Chicago • Detroit • Shreveport • Los Angeles • San Francisco • Portland, Ore.

Circle 612 on Page 119

To cut costs with conveyors

Ask Standard

Starting at the molding machines, a complete Standard conveyor system, with transfer cars, is used to move flasks and molds to pouring and storage area, with return lines for empty flasks.

Step up core making production with low-cost roller conveyors

Foundries are finding new savings in production with Standard s low-cost gravity conveyors. One user of national repute states these conveyors have "worked out just fine" for making and handling cores, before and through the oven.

Heavy-duty Standard foundry roller conveyors equipped with shielded bearings make possible smooth, efficient handling of molds and flasks.

Standard offers specialized experience of more than 50 years of designing and building foundry and mill conveyors. For any conveyor need, contact STANDARD CONVEYOR COMPANY, General Offices: North St. Paul 9, Minnesota.

Left: simple, low-cost Standard gravity conveyors speed core making and handling, before and through oven. *Right*: roller conveyors carry molds to the pouring floor.

Send for Standard's special catalog — a valuable reference book illustrating and describing various conveyor installations in leading foundries. Ask for Bulletin 68 — address Dept. N-6.

Standard

GRAVITY & POWER CONVEYORS

OVER 50 years of conveyor experience

Sales and Service in Principal Cities

Every morning, every top man, immediately before he hung up his hat, and before he looked at his mail, would stick his head into the office of each of the individuals who report to him (his staff members), and without condescension, paternalism, rank-consciousness, or a word about the work, he would say, "Howdy, Sam."

Imagine that through executive decree, with the threat of immediate dismissal for disobedience, every department head, superintendent, foreman and straw boss, every morning or shift, before he did anything else, greeted each individual who reported to him on a man-to-man basis with honest sincerity. If through such a system it became impossible for any member of the organization to take up each day's work without being recognized as a fellow human being, it wouldn't be long before that organization would take a new lease on life and work. Even the army has roll call and inspection, where each individual receives personal recognition and has his presence acknowledged.

It may seem that I'm making a mountain out of a molehill, but I know definitely that I am not. There are organizations that respect elementary good manners and profit from using them. Many labor relations conflagrations start in the dry tinder of a taken-for-granted area of neglected opportunity. Misunderstandings, gossip, and negative progaganda thrive in unnecessary isolation.

In my estimation, it would take at least a full year for a sincere "Howdy Rounds" program to prove its full effectiveness. Here's a research field that wouldn't cost a penny. It can be an effective catalyst for the release of dormant, but high-potential productivity. Besides, it's a form of organization respectability.

Book Review

AUTOMATION AND MANAGEMENT, by James R. Bright, 270 pages, published by Division of Research, Harvard Business School, Boston 63, Mass. Price $10.

A realistic approach to the subject is based on conclusions reached as the result of exploration of the subject with more than 300 industrialists. The book is a study directed toward the managerial aspects of so-called automation problems. Economics of to-automate or not-to-automate are illustrated by 13 actual case histories from diversified industries.

Actual photograph of a Cast Tooth Sprocket Gear in ASTM: A-148-53T Grade 90-60 Steel made in H-W Forsterite Grains shell mold by Fort Pitt Steel Division, Pittsburgh Steel Foundry Corporation.

SMOOTH CAST SURFACES result from resin-bonded shell molds of H-W FORSTERITE GRAINS

Forsterite grain is highly refractory magnesium silicate possessing physical properties which make it especially suited for resin-bonded shell molding. Its specific heat, thermal conductivity, high temperature stability and uniform thermal expansion —all contribute to its excellent performance.

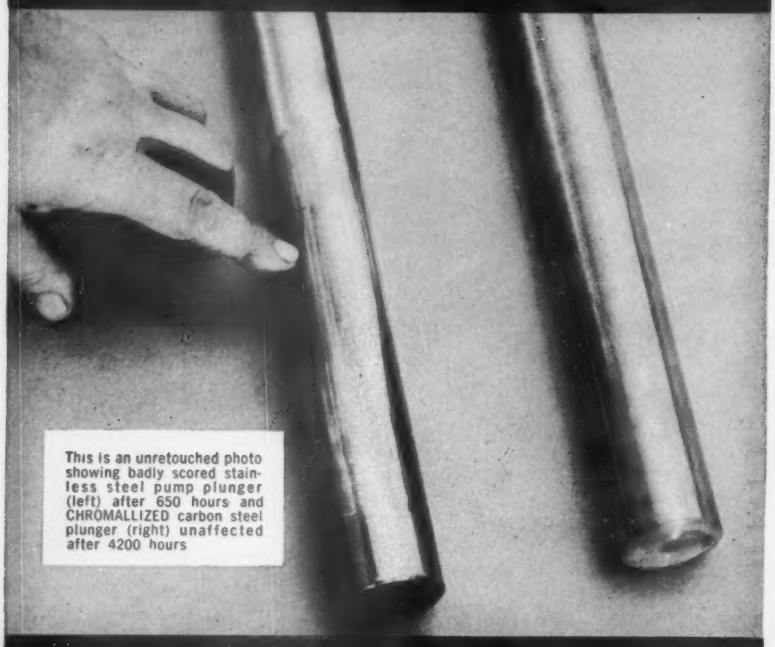
As the result of the optimum chilling effect of forsterite grain, sufficient strength develops in the skin of the steel casting to resist outside gas pressure as well as inside ferrostatic pressure, and a smooth casting surface is assured.

H-W FORSTERITE GRAINS are supplied in controlled sizings best suited for securing the most satisfactory shell molded casting surfaces.

H-W FORSTERITE FLOUR is furnished for use as an additive to the H-W FORSTERITE GRAINS and resin mix to provide for the ultimate in surface smoothness, particularly of castings with heavy sections. Write for bulletin No. 6.

HARBISON-WALKER REFRACTORIES COMPANY
AND SUBSIDIARIES *World's Most Complete Refractories Service*
GENERAL OFFICES: PITTSBURGH 22, PENNSYLVANIA

Do you use water pressure to clean castings?



This is an unretouched photo showing badly scored stainless steel pump plunger (left) after 650 hours and CHROMALLIZED carbon steel plunger (right) unaffected after 4200 hours

CHROMALLIZED POWER PUMP PLUNGERS LAST 2400 HOURS LONGER, COST 28% LESS

PLACE: Elyria Foundry, Elyria, Ohio.

APPLICATION: Vertical power pump generating pressures up to 2200 psi used to clean sand castings.

PROBLEM: Plunger abrasion from sand particles in the atmosphere.

SOLUTION: CHROMALLIZED carbon steel plungers.

Material	OLD PLUNGER 420 Stainless	CHROMALLIZED PLUNGER Carbon Steel
Price	a. (Purchase) $42.50 b. Regrinding (twice) $15.00 c. Maintenance $47.50 d. Total $105.00	$75.00 — — $75.00
Service Life	(With 2 regrindings) 1800 hrs.	4200 hours

CHROMALLIZING is a patented chromium diffusion process which provides a surface as hard and wear resistant as chromium carbide.

Chromalloy Corporation is equipped to CHROMALLIZE your existing pump plungers or provide new replacement parts.

Chromalloy CORPORATION

450-A Tarrytown Rd. • White Plains, N. Y. • WH 6-0020

Meditations of a Sandman

By HAROLD E. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.

"Let's Recheck"

THIS matter of writing for publication would appear to involve merely the effort of placing one word after another, the result, when read by one having a similar vocabulary and experience to those of the writer, should, variously, serve to instruct, entertain, infuriate, cajole, or even soothe.

If, for any reason, a writer can't think of the right word, he can turn to his dictionary, which has more words than he'll ever need and some that he wouldn't dare to use.

I believe it was Francis Bacon who said, "Reading maketh a full man; talking maketh a ready man; and writing maketh an exact man." If what I've been doing can be called writing, I'm sure that some of my readers will question the *exactness* of many of my statements. Mark Twain once observed that, "Truth is a most desirable quality, but it certainly handicaps you as a conversationalist!"

I'll agree with Bacon, however, to the extent that I believe I am more nearly exact when I write than when I talk. We have the Bible injunction, "What I have written, I have written," the significance of which should tend to frighten any man who would put pen to paper. His thoughts thus may become visibly indelible for all to see and criticize, and he is quite likely to have branded himself a fool.

Immune to Insult—A dignified man lives constantly in fear of such a reputation, but a sandman is restrained by no such fear. Daily reprimands have toughened his armor to the point where he has become immune to insult, and he glories in this immunity.

Of course, this statement does not apply to all sandmen. Some are more rational, and they submerge

RATES A PEDESTAL FOR *Quality*

NEVILLE FOUNDRY COKE

AS A MERCHANT producer serving the foundry industry, Pittsburgh Coke & Chemical Company takes special care to produce foundry coke of exceptionally high and uniform quality.

And that means, among many other things, the selection and scientific blending of clean, washed coals containing a high percentage of low volatile Pocahontas. The result is a dense, strong uniform coke that has more fixed carbon and less ash and sulphur.

The final proof of quality is in your cupola. *NEVILLE* Foundry Coke provides maximum temperature at the nose of the tuyere to give you *hotter, cleaner, more fluid iron.*

The sale and use of *NEVILLE* Foundry Coke is backed by an experienced staff of Sales Representatives and Service Engineers familiar with cupola problems. We'd like to help you with *your* problems. *Call or write today!*

WBW 7017

Neville Pig Iron and Neville Coke for the Foundry Trade

COKE • PIG IRON • CEMENT • COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON

Circle 616 on Page 117

their emotions in a disgruntled silence.

If you will read the foregoing again, you must admit that this writing job consists simply of putting one word after another—and you'll probably wonder whether it was worth the effort. As usual, I digress. But now to matters of a more serious nature.

The process and condition which we pretentiously designate "foundry sand control" is a phase of foundry practice which means different things to different people. It may be one thing in a laboratory and something quite different in a high-production automotive foundry or other specialty shop or, to go from the sublime to the ridiculous, in an old-style, five-man jobbing shop.

One Goal—Yet, essentially, we all are striving for the same thing—a higher quality of casting at the lowest practical cost of production, through an intelligent approach to sand control. To do this, we must obtain some degree of constraint over our sand properties, and each of us, in his own way (sometimes mysteriously), is doing or attempting to do this. Because of the wide diversity of our requirements, as well as the startling variations in our sand, materials, equipment, and machines, it is difficult if not impossible to write down a standard mode of procedure.

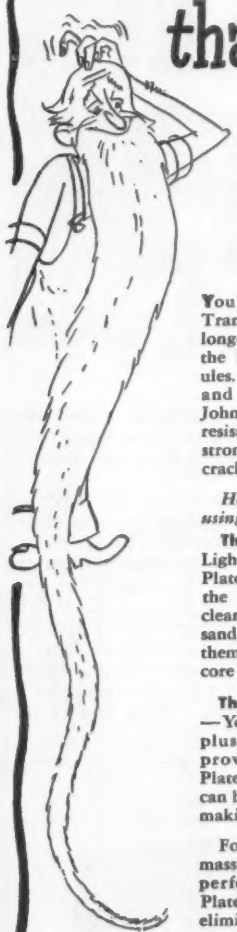
Let's recapitulate a bit. Barely 50 years ago, all foundries operated with naturally bonded sand, a material which nature had distributed rather lavishly about this old globe of ours, in such manner as seemingly to dictate man's industrial performance, present and future. France, Belgium, and Italy were endowed with a supreme quality of sand for statuary molding, and it is from these areas that the world has received much of its "deathless bronze." England and Germany were favored with molding material that enabled them to produce the castings required for their large and small engines, as well as a variety of other work.

Nature Was Good — In the United States of America, where the spirit of liberty and free enterprise beckoned, nature had provided the answer to a foundryman's dreams—sand, clay, coal, and iron in seemingly inexhaustible quantities, and almost in his backyard. Alabama, New Jersey, Illinois, and Tennessee, to name but a few, have provided molding materials that stirred the imagination and the ingenuity of the pioneer foundryman. Despite the high quality of his early sand deposits, he made no recorded attempt to conserve the supply or to devise means of adequate reclamation. He probably thought that this sand would last forever, with no variation in properties. He since has learned the error of his ways.

It probably was the college-bred son of an illiterate foundryman who was the first to analyze foundry sand and come up with an answer which he termed "synthetic." If my guess is correct, I'll bet the old man drove him out of the shop at the first mention of his synthetic nonsense. He probably told the kid to stick to football and keep out of the foundry.

But regardless of who it was that first brought about this departure from the old practice, I suggest that a statue of heroic proportions be erected to his memory, for he deserves to be cited as the father of foundry sand control. As a pioneer, he blazed the trail for our automotive and other high-production shops and for all the progressive sand practice which followed. We owe him an undying debt of grati-

Looking for core plates that LAST LONGER?



. . . then use TRANSITE CORE PLATES that stay on the job year in, year out

You can rely on durable Transite* Core Plates to give long-term service, even under the heaviest foundry schedules. Made of fibrous asbestos and cement, by a special Johns-Manville process, they resist shock and corrosion, are strong and durable, will not crack or break easily.

Here are more reasons for using Transite Core Plates:

They speed production—Light-weight Transite Core Plates are easier to handle on the job. They're easier to clean, too . . . core wash, sand, etc., do not adhere to them as readily as to other core plate materials.

They maintain accuracy—Years of foundry service, plus exhaustive tests, have proven that Transite Core Plates do not warp readily . . . can be used for precision core making indefinitely.

For core plates of large mass and small surface area, perforated Transite Core Plates are also available to eliminate green cores and reduce baking time. For full details, write Johns-Manville, Box 14, New York 16, N. Y.

JM PRODUCTS

*Reg. U. S. Pat. Off.

Johns-Manville TRANSITE CORE PLATES

Made of Asbestos

tude! And remember, gentlemen, *formulated* sand practice still is in the diaper stage!

Foundry Secrets—There was a time when it was every man for himself: "Guard your secrets jealously!" "Tell 'em nothing!" The foundry had a bad reputation and deserved it.

Today, the most brilliant minds in the industry are bent on solving every problem that confronts us, and we are permitted to share freely in their success, at a very moderate cost indeed. They constantly seek new roads for us, roads that will shorten the distance, lower the grade, and reduce the tariff. But even these brilliant minds are not infallible. They will make mistakes, but as each annual account is balanced, the industry will find itself incredibly richer.

We now have methods of determining the moisture content of our sand, its strength through most stages, its permeability, collapsibility, durability, moldability, "swellability" (deformation), and just plain stability.

We also think we know something about *flowability*, but I am rather dubious as to the *dependability* of the instruments or devices thus far produced which purport to indicate or measure this desirable property.

I recently purchased an inexpensive gadget, manufactured by one of our most reliable instrument makers, which professed to be the last word in flowability determination. In its use, I followed instructions to the letter. The instrument told me—in the only way it could—that my sand had poor flowability and obviously was unsuited to the work I was doing in green sand.

This news startled me, for I had reason to believe that my sand was as flowable as any in the area. In fact, I had been supported in this opinion by my old professors, Sanders and Schureman (alphabetically listed to avoid preferential treatment).

Having invested my boss's hard-earned money—about $12—in this flowability determinator, I was expected to make the darn thing work. So I tearfully appealed to another old friend of mine, who has dabbled slightly in sand problems and who is now a full-fledged citizen of California. His name is Frank Brewster. (We've adopted the guy, and he likes us!)

No Comparison—Frank was quite familiar with the instrument in question and with its history. He explained that this particular device had been designed to indicate the flowability of a number of sands currently used in the East and Middle West and that by the standard adopted, it had proved quite reliable. Some of our western sands, however, and especially the one I happened to have, were of an entirely different texture and behavior. Therefore the eastern scale did not apply.

To my immense relief I learned that my reading probably equalled the figure which was considered acceptable on eastern sands. But I am still somewhat confused by an annoying thought. Does this instrument actually measure flowability, or is it just another version of relative green compression strength?

I hope some day to meet the inventor of this flowability tester to get the story of the whyfore and wherefore of his experiments and conclusions. Perhaps then, I will be able to realize fully my $12 investment. Or I may learn that he has produced something infinitely better. Either way, I win! In fact, we all win!

Bulletin Covers Fire Fighting Protection and Equipment

A pamphlet designed to help small business executives solve problems in private fire protection has been announced by the Small Business Administration. Entitled "Fire-Fighting Equipment for Small Plants," the pamphlet is No. 59 in the SBA series of Technical Aids for Small Manufacturers.

Edited by John W. Gracik, mechanical engineer with the administration, the pamphlet describes principal types of fire-fighting equipment available to owners, and indicates specific uses and advantages of each. Copies can be obtained from the Government Printing Office, Washington 25, upon request.

Spectrographers Will Meet

New developments in spectroscopy will be described by leaders in the field in this country and abroad at the annual Symposium on Spectroscopy to be held in Chicago at the Pick-Congress Hotel, June 9 to 11. Twenty-eight papers will be presented at five technical sessions. Four seminars and three panel discussions also will be held.

For more information, write to H. J. Hettel, Armour Research Foundation, 10 W. 35th St., Chicago 16, Ill.

Circle 618 on Page 117→

MALLEABRASIVE

MORE RIDES

Malleabrasive goes for "more rides"—retains its grade particle size longer—has longer cleaning life, because of its own exclusive metallurgical structure—found in no other metal abrasive.

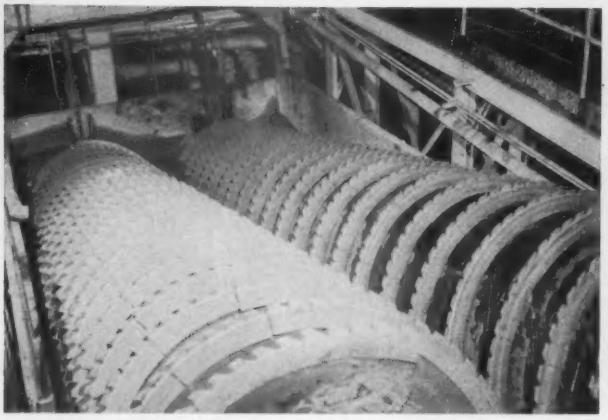
Tough and shatter-resistant, its slow breakdown rate prevents the excessively fast accumulation of "fines" that slow up cleaning, destroy machine replacement parts and build up cleaning costs.

Yes, cleaning costs are lower with Malleabrasive—proven in plant after plant. We'll show you why—cite you cases. Write us.

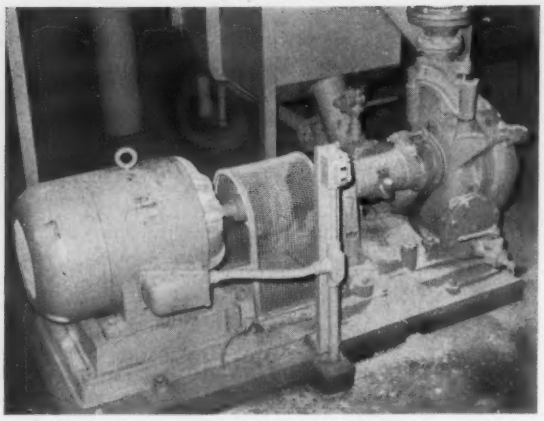
NOW IN 50 LB. BAGS

THE GLOBE STEEL ABRASIVE CO.
Mansfield, Ohio

Sold by Pangborn Corp., Hagerstown, Md., and by many leading distributors of foundry supplies from coast to coast.



High-chromium-molybdenum wear shoes on screw-type sand classifiers triple or quadruple service life



Promising use for alloy is in wearing parts of pumps handling abrasives or mildly corrosive sand slurries

High-Chromium-Molybdenum White Iron For Abrasion-Resistant Castings

By T. E. NORMAN
Metallurgical Engineer
Climax Molybdenum Co.
Div. of American Metal Climax Inc.
Denver

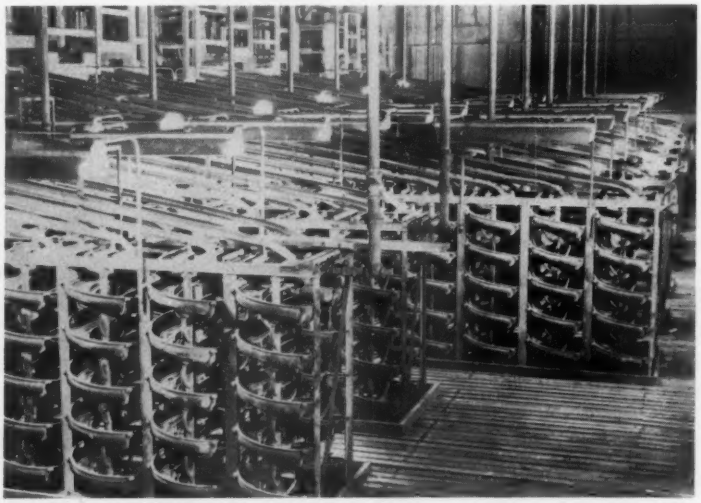
THE combination of outstanding abrasion resistance, relatively good toughness and moderate corrosion resistance obtainable from high-chromium types of white iron is worthy of greater attention by both producers and users of abrasion-resistant castings. This point has become increasingly important in recent years.

The cost of producing all types of castings has increased rapidly; at the same time, the cost of shutdown time and of labor to replace these castings has become a matter of increasing concern. Consequently, the cost of alloys used in these relatively highly alloyed high-chromium irons has become a minor factor in relation to the savings which may be achieved by their use.

Basically, these high-chromium white irons consist of a structure in which hard carbides of the Cr_7C_3 type exist in a matrix of martensite and/or austenite. The distribution and shape of the carbides are such that they are surrounded and well supported by the matrix. Accordingly, these irons have substantially greater toughness than the low-alloy types of white iron, in which the Fe_3C type carbides form the continuous phase.

To obtain the desired structure in these high-chromium irons, the chromium content must exceed about 10 per cent for production of the Cr_7C_3-type carbide. At the same time, the alloy content of the matrix must be sufficient to suppress the formation of pearlite or bainite. Molybdenum additions are very effective in suppressing pearlite formation in these irons. Furthermore, molybdenum additions effectively keep the Cr_7C_3-type carbides, which otherwise form coarse, relatively brittle crystals, in a fine state of dispersion. The result in turn permits the use of higher carbon contents which normally improve abrasion resistance.

Toughness Enhanced — The retained austenite which commonly exists in the matrix of these irons initially is relatively soft and probably enhances the toughness of the castings. It also is highly metasta-



Spiral mineral-concentrating units of high-chromium-molybdenum white iron provide test for the alloy. Susceptibility to breakage is much lower

International Minerals & Chemicals

A REPORT TO FOUNDRIES

Aluminum Slip Flasks and Taccone?

SURE!

Judging from the reaction in our Convention booth in Cleveland, the use of a Taccone molding machine with aluminum slip flasks was real news. Too much has been said about "heavy" flasks and "super" loads and not enough about the simple but effective upset-strike-off design. This design permits normal flask weights and depths and even—as you saw in Cleveland—aluminum slip flasks.

This particular machine was equipped with roller rail-lift, but bar or pin lift is equally popular. In any event, all of the advantages of high pressure molding are available in light, shallow, or slip-type flasks.

If you are a slip flask user, drop us a line and let us show you what you can do to make better castings in green sand.

The 16 x 20 inch, 6 over 6 aluminum slip flask and upset have been filled with sand ready for the diaphragm squeeze. The upset is heavy steel, but part of the machine. It does not require any additional time or labor.

The squeeze has been completed and the flask is ready for stripping. Note that the depression made by this "high pressure molding" is all within the four walls of the upset. No outward load is placed on the flask itself.

The upset has been removed. The sand is ready to be struck-off. Most visitors in the booth were surprised to learn that only a "wall" of sand remains to be struck-off. What sounded so hard... turned out to be so easy.

The stripped and struck-off drag is ready for roll-over by any device available (including homo sapiens). After closing, the slip flask is removed from the mold and the operation is repeated in a perfectly normal fashion.

International Minerals & Chemicals

EASTERN CLAY PRODUCTS DEPT.

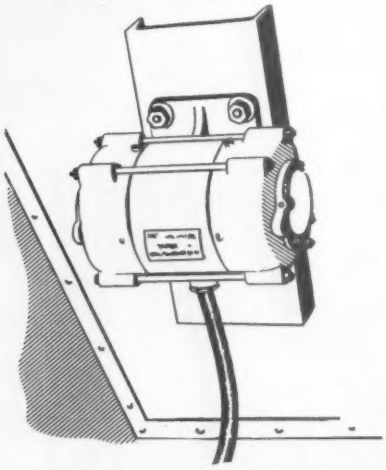
INTERNATIONAL MINERALS & CHEMICAL CORPORATION

20 NORTH WACKER DRIVE, CHICAGO 6 • PHONE: Financial 6-1800

Circle 619 on Page 117

SHORT OF AIR?

Air vibrators for bins, chutes and hoppers are very efficient. But if your air compressor is a little overworked these days, it will pay you to investigate Cleveland's complete line of electric vibrators.



They're manufactured to the same high quality standards that have made Cleveland Air Vibrators so popular with the foundry industry.

Write today for a copy of our new Electric Vibrator Catalog.

Dept. H3, 2788 Clinton Ave., Cleveland 13, Ohio

Circle 620 on Page 117

ble, so that it work-hardens rapidly on the wearing surfaces to provide support for the carbides and additional wear resistance. An austenite of this type should be relatively low in manganese or nickel contents, which tend to stabilize it and to lessen its wear resistance.

One composition range which has been used for these high-chromium irons contains 2.25 to 2.85 per cent carbon, 24 to 30 per cent chromium, 0.50 to 1.25 per cent manganese, and 0.25 to 1.00 per cent silicon. Up to about 1 per cent molybdenum and/or vanadium have been added to this composition to improve its wear resistance and other properties still further.

This 27 per cent chromium type of iron has been produced for many years by a number of foundries in the USA and other countries. Modifications of the composition also are used extensively in hardfacing weld deposits. It generally has shown its most outstanding results in applications where erosive types of wear are encountered.

If the carbon content of these 27 per cent chromium irons exceeds about 2.75 per cent, some of the Cr_7C_3-type carbides have a tendency to develop as large carbide spines. These spines may fracture or spall on a microscopic scale at the wearing surface of the casting and thus detract from its wear resistance.

This tendency to produce coarse, brittle carbides in the higher carbon compositions can be prevented by lowering the chromium content of the iron to a range of 12 to 18 per cent and combining this with a 2 to 4 per cent molybdenum addition. With this alloy combination, carbon contents up to about 3.5 per cent (and possibly higher) may be used without danger of developing the large carbide spines. So long as the carbides can be maintained as a fine dispersion, the higher carbon contents appear to be capable of further enhancing the abrasion resistance of the iron.

This 12 to 18 per cent chromium, 2 to 4 per cent molybdenum composition forms the basis for the Climax Alloy 42 iron which the author has studied in various commercial applications during the last several years. A well-balanced composition range for this alloy 42 is, in percentages, as follows: C, 3-3.5; Si, 0.3-0.6; Mn, 0.5-0.9; Cr, 15-18; Mo, 2.75-3.25; S, 0.06 max; P, 0.10 max.

In section sizes up to about 1 in., castings from this composition are used preferably in their as-cast condition. A stress relief at 400-450° F improves toughness without injuring the alloy's abrasion resistance.

Heat Treatment — Heavy-section castings may develop an undesirable amount of pearlite or bainite in their structure when they cool slowly in sand molds. A hot shakeout and an air quench may be used to suppress such formation. A preferable treatment for most heavy-section castings is to give them a conventional air-hardening heat treatment. They should be heated slowly to 1900-1950° F, soaked about one hour per inch of section, and cooled in still or gently moving air. After they have cooled to room temperature, they should be stress relieved at 400-450° F. Any grinding on these heat-treated castings should be done only after the heat treatment has been completed.

TABLE I—COMPARISON OF MECHANICAL PROPERTIES

	—Alloy 42— As Cast	Heat Treated	Pearlitic White Iron As Cast
Vickers DPH hardness, 10-kg load.	519	803	569
Transverse strength, 18-in. span	2235	2900	1600
Deflection at failure, inches ..	0.125	0.137	0.085
Relative toughness*	279	398	136

*Relative toughness here is based on breaking load times deflection.

A comparison of typical mechanical properties of this alloy 42 and of a low-alloy, pearlitic type of white iron, tested as 1.2-in.-diam. transverse test bars, is shown in Table I.

Regarding relative abrasion resistance of these materials, it should be appreciated that there is practically no correlation between abrasion resistance and indentation hardness. The relatively low hardness of alloy 42, as cast, is due to its retained austenite content. Retained austenite of this high-carbon, high-chromium type is very wear resistant.

You're right—Your department does need a conveyor"

Performance in Service — Comparative service life data or figures on relative weight losses in service have been obtained by the author for a number of commercial applications in which relatively rapid wear by abrasion occurs. Such applications are included as sand pump impellers and cases, flotation cell impellers, wear shoes for spiral-type sand classifiers, chute liners, and grinding balls.

In each application, the high-chromium irons have shown from two to four times better abrasion resistance than the low-alloy types of pearlitic white iron. In the sand pumps and the classifier wear shoes, the high-chromium irons also show two or three times better wear resistance than martensitic white irons of the 4.5 per cent nickel, 1.5 per cent chromium type. In some of these applications, mildly corrosive abrasive slurries are being handled. Under these conditions, the superiority of the high-chromium irons may be due in part to their better corrosion resistance.

In the author's tests, the alloy 42 composition has shown about a 10 to 30 per cent superiority in wear resistance over the 27 per cent chromium grade of high-chromium iron. It is believed that this degree of superiority can be further increased by holding the carbon content of alloy 42 near the high side of the recommended range.

In light-section castings, alloy 42, as cast, has shown equal or slightly better abrasion resistance than the same composition in its heat-treated condition, even though the indentation hardness of the as-cast material was lower. On the other hand, heavier-section castings, (over about 1-in. wall thickness) may contain appreciable amounts of pearlite in their as-cast structure. This pearlite tends to injure their abrasion resistance. It generally is advisable, therefore, to give such heavy castings the recommended reheat and air quench. As a possible alternative, a hot shakeout (above 1300° F) after casting, followed by air cooling and stress relief, may be sufficient to suppress this pearlite and produce optimum abrasion resistance.

Accompanying illustrations show some typical and promising commercial applications for the alloy 42 type of iron. It seems very probable that as this material becomes better known and more widely produced, it will find many economic fields of application in service involving severe abrasive wear and also in applications requiring combinations of wear resistance and corrosion resistance.

Circle 621 on Page 117→

Planet cope tipper mechanism (left) and shakeout area

HANDLES MOLDS ON EIGHT SECOND CYCLE

PLANET AUTOMATIC SHAKEOUT SYSTEM ELIMINATES "BARBECUE PIT"

This automatic shakeout system, which eliminates pitchfork men in the pit, was recently installed by Planet Corporation at a large automobile manufacturer's foundry. A high production system, it handles one mold every eight seconds.

Here's how it works:

As a mold reaches the shakeout area, a tipper mechanism strips the 500 lb. cope flask off the lower portion, inverts it, and drops it onto a shakeout unit. Oscillating action shakes out the sand. It is then moved back to the cope molding machines automatically by powered roller conveyors.

The drag flask is pushed by an air cylinder onto a tipper table. Its tipping action throws the hot castings onto another shakeout unit. Following shakeout, an oscillating conveyor moves the castings and automatically loads cooling buckets. The drag flask is then lowered and pushed onto a third shakeout unit where it is cleaned and then carried to the drag molders by powered roller conveyors.

The hot sand, which has been removed from the flasks and castings, is collected below the shakeout units, and conveyed back to Planet's sand mixing and distributing system for re-use.

The entire shakeout operation is automatic and requires supervision by only one man.

IT PAYS TO PLAN WITH PLANET

If your foundry has a shakeout or materials handling problem, let Planet demonstrate how its engineering skill and know-how can help you. It paid this manufacturer to "Plan with Planet," it will pay you too. Write or phone today . . . there's no obligation, of course.

PLANET CORPORATION

1818 SUNSET AVENUE
LANSING, MICHIGAN

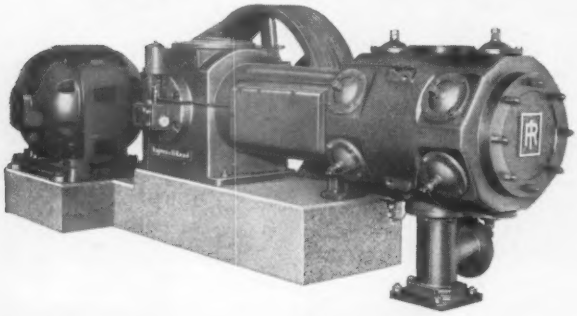
- ENGINEERED HANDLING SYSTEMS
- AUTOMATION EQUIPMENT
- FOUNDRY HANDLING EQUIPMENT

87

NEW COMPRESSORS

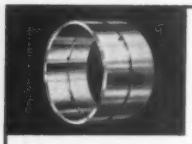
...with heavy-duty features proven in larger Ingersoll-Rand compressors

ESH* (horizontal)



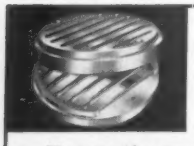
ESV* (vertical)

*The same compressor in either horizontal or vertical arrangement – 20 to 150 hp sizes, single-and multi-stage, pressures up to 5000 psi and vacuums.



Full-floating aluminum bearings never need adjustment

The full-floating bearings "roll with the punch," taking each thrust on a different portion of the shell. They are foolproof, and never require fitting or adjustment. Main and crankpin bearings are made of I-R's special aluminum bearing alloy, which has higher load capacity and better heat conductivity than other bearing materials.



Air-cushioned Channel Valves give unmatched performance

Known the world over for lasting efficiency, dependability and quiet operation, Ingersoll-Rand air-cushioned Type A Channel Valves are entirely different in design and principle from any other valves in use. Type A Channel Valves were developed especially for modern compressor speeds, and feature a separate stainless-steel seat plate which can be reversed or replaced for new life.

Never a need for adjustments– frame is kept sealed!

Here's an entirely new line of compressors, built to run longer — much longer. They're more compact, more efficient, and require less attendance, less maintenance. They offer greater capacity in less space, and are ruggedly built and highly refined to take years of continuous hard service.

All running parts are precision-machined and need no fitting or adjusting, so the frame is sealed — dirt stays out, and the major causes of wear are eliminated!

There are many design features—including filtered force-feed lubrication and full-floating self-adjusting metallic packing — that have heretofore been found only in larger Ingersoll-Rand compressors. Let your I-R representative tell you more about these new compressors, and how they can save you money.

Ingersoll-Rand

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In engineered products, there's no substitute for experience!

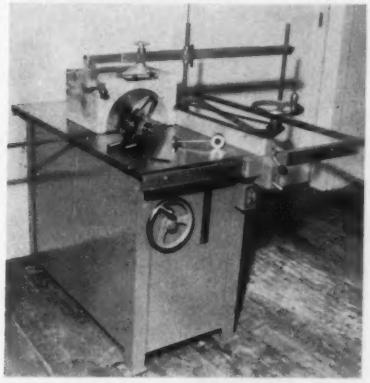
COMPRESSORS • GAS & DIESEL ENGINES • PUMPS • AIR & ELECTRIC TOOLS • CONDENSERS • VACUUM EQUIPMENT • ROCK DRILLS

FOUNDRY EQUIPMENT AND SUPPLIES DIGEST

For More Details on These Items Use Reply Card —Page 151

COREBOX MACHINES

Three models of chain feed corebox and fillet machines are designed for making elbow, straight, and irregularly shaped wood coreboxes in diameters from 11/16 to 16 in. The machines also will make 11/32 to 8 in. straight or circular wood fillets. All three models have stationary steel table tops with elevating ball



bearing arbors, double cam lock fences with graduations to 24 in., and graduated arbor depth gages with pointers. The large machine has a 24 x 48-in. table top, and cuts 6 to 16-in. diam boxes to a depth ½ in. deeper than the cutting radius. The medium-sized unit has the same size table and cuts 6 to 12 in. boxes ½ in. deeper than radius center. Top of the small machine is 18 x 36 in.; it cuts 11/16 to 6-in. boxes 5/16 in. deeper than the radius center. — **Glover Mfg. Co.**, Meadville, Pa.

For More Details Circle No. 401—Page 151

VACUUM ARC FURNACES

Vacuum arc furnace designed for pilot plant or small-scale production of pure melts of metals and alloys with high melting temperatures is rated at 3000 amp max and handles melts from buttons to ingots, up to 40 lb of titanium or 70 lb of steel. Five interchangeable crucibles are included. Fixed electrodes of tungsten or metallic carbides, or consumable electrodes of the metal being melted, may be used. Consumable electrodes up to 4½ in. diam and 19 in. long are fed automatically. The pump, made by Roots-Connersville Blower Div., Dresser Industries, is said to pull down a "clean" furnace from atmospheric pressure to one micron in 40 seconds. Pump throughput of 10,400 micron cfm at 10 microns handles sudden gas bursts encountered with certain metals.—**Rochester Div., Consolidated Electrodynamics Corp.**, 1775 Mt. Read Blvd., Rochester, N. Y.

For More Details Circle No. 402—Page 151

HEAT-RESISTANT VISOR

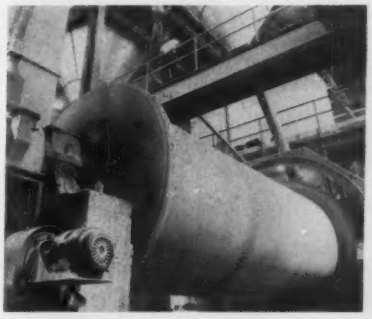
Shatterproof plastic visor is designed to protect the wearer's face against radiant heat above 2000° F. A transparent coating on the visor is

said to reflect 95 per cent of infrared rays. The coating is applied to the visor under vacuum in such a manner that visibility through the visor remains high and temperature between visor and the wearer's face remains at approximately 80° F.—**Vacuum Equipment Div., New York Air Brake Co.**, Camden, N. J.

For More Details Circle No. 403—Page 151

SILICA FLOUR

Silica flour may be supplied to customer specifications as well as in standard grinds. Modern production methods and techniques employing electronically controlled tube mills and controlled air sepa-



rators are said to insure good uniformity of each grade of silica flour from shipment to shipment.—**Pennsylvania Pulverizing Co.**, Two Gateway Center, Pittsburgh 22, Pa.

For More Details Circle No. 404—Page 151

AIR HOISTS

Line of link or roller chain hoists with capacities of ¼, ½, or 1 ton features aluminum alloy frames, alloy steel heat treated gearing with machine shaved teeth, easily adjusted load brake, built-in muffler, one-hand pendant cord control, and upper and lower steel safety hooks. Hoists operate on a line pressure of 80 psi.—**Shaw-Box Crane & Hoist Div.**, Manning, Maxwell & Moore Inc., Muskegon, Mich.

For More Details Circle No. 405—Page 151

DEW POINT MEASUREMENT

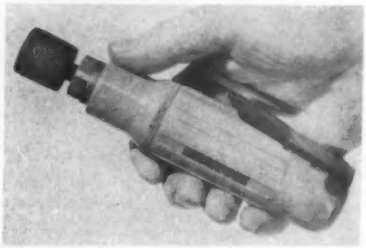
Instrument measures dew point of pressurized gases over the range of room temperature to minus 80° F. It is intended for applica-

tions on gas pipe lines, compressed air lines, instrument air lines, bottled gas, and similar equipment. Foundry applications include use in degassing operations and oxygen blowing of steel.—**Illinois Testing Laboratories Inc.**, 420 North La Salle St., Chicago 10, Ill.

For More Details Circle No. 406—Page 151

PNEUMATIC TOOL

Rotary vane pneumatic tool, the Dotco Model 2GL, is said to be cool-running up to 25,000 rpm with plenty of power to maintain high speed under heavy loads incurred

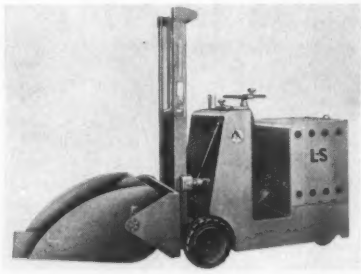


in many types of grinding, deburring, and finishing operations. Equipped with Erickson 200 series collets as standard, the tool can accept 3/8-in. shanks of larger wheels, burrs, and sanding discs. The tool is 51/64 in. from center line to side of the tool, has an over-all length of 5¾ in., and weighs 1 lb, 5 oz.—**Doeden Tool Corp.**, Sherwood, Ohio.

For More Details Circle No. 407—Page 151

DUMP BUCKET SCOOPS

Hydraulic and mechanical dump bucket scoops for bulk handling now are offered as optional equipment

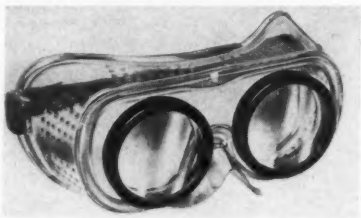


on the company's complete line of electric fork trucks. The hydraulic scoop is available in either 5 or 10-cu-ft capacities and is operated from controls in the driving compartment. Materials are held in the scoop by tilting it to its maximum 30-degree upward tilt. Maximum 45-degree downward tilt affords complete dumping of materials. The mechanical scoop is offered in the same capacities. It has an upward tilt of 10 degrees and downward tilt of 45 degrees. Actuation is by tilting the mast of the truck.—**Lewis-Shepard Products Inc.**, Dept. R8-3, 125 Walnut St., Watertown 72, Mass.

For More Details Circle No. 408—Page 151

SAFETY GOGGLES

Coverall goggles in both welder's and chipper's models are constructed with soft vinyl plastic frames. They are said to provide exceptional comfort and lightness. Model GW-400, for welders, has lightproof indirect ventilators to eliminate harmful light rays and glare and is fitted with removable rings and Glenweld filter lenses. Model GC-400, for chippers, is shown here. It is similar in style to the GW-400, except that direct ventilation and a clear frame are provided. Replaceable rings are fitted with clear, safety-hardened or laminated Glenrock 50-mm lenses.



Both models are equipped with pliable nose shields for added protection. Prescription glasses can be worn under them.—**Glendale Optical Co.**, 600 W. Merrick Rd., Valley Stream, L. I., N. Y.

For More Details Circle No. 409—Page 151

HOSE FITTINGS

Fittings are designed for 360-degree positioning and operation under impluse conditions where hose lines require additional flexibility of motion due to twisting and vibration. They are available in 3/16 to ½-in. tube sizes for operation with pressures up to 3000 psi and in a temperature range of − 65 to + 300° F.—**Altair Inc.**, 50 MacQuesten Parkway South, Mount Vernon, N. Y .

For More Details Circle No. 410—Page 151

LOW-EXPANSION CERAMICS

Lithium-aluminum-silicate, low-expansion ceramics resistant to molten aluminum are being investigated for use as furnace linings for aluminum melting furnaces and for molten aluminum containers. Other potential uses include kiln furniture, crucibles, firing supports

Air-Powered Conveyor Handles Hot Material

Air-powered, all metal vibrating conveyor is designed to handle hot materials. The conveyor shown here consists of three 12-ft units. It transports hot sprues from shakeout to scrap pile. Each conveyor unit is a spring-mounted trough vibrated by an air-powered drive mechanism requiring air at 20 psi. The conveyor, which is said to operate at low maintenance cost, has no bearings, cams, couplings, motors, shafts, or pillow blocks. The only moving part is an air piston lubricated automatically by oil injected into the air line. The conveyor will move granular materials as well as small parts horizontally or at an incline of 5 degrees, it is claimed. A similar conveyor is available in tubular shape. It will feed at an upward angle of 20 degrees when the tube is full.—**Cleveland Vibrator Co.**, 2828 Clinton Ave., Cleveland 13, Ohio.

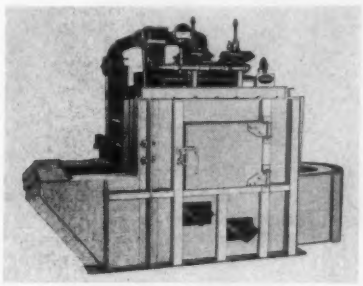
For More Details Circle No. 437—Page 151

in industrial and laboratory furnaces, and calcining trays. One ceramic, E-313, has a zero coefficient of expansion and can be used continually at temperatures up to 1830° F; short-term temperature peaks can go up to 2100° F. It has a flexural strength of 8000 psi. Ceramic E-105 has a coefficient of expansion of 10 x 10^{-7} cm/cm/degree C. Flexural strength is 2000 psi, and it has a total porosity of 20 per cent. Service temperature is 2000° F.—**Corning Glass Works**, Corning, N. Y.

For More Details Circle No. 411—Page 151

MELTING-HOLDING FURNACES

Combination melting-holding furnaces are available in capacities of



1200 to 5000 lb of aluminum. They may be used for diecasting, permanent mold casting, and sand casting applications. Operation is fully automatic. Rejects and back scrap can be charged on the sloping hearth, eliminating any contamination of the inside of the furnace from foreign metal which may be in the aluminum. The furnaces can be built with or without tap holes for complete draining. A bridged, ladle-out well allows constant chlorinating. Melt loss is said to be reduced by radiant roof heating. **Sunbeam Corp., Industrial Furnace Div.**, 4433 West Ogden Ave., Chicago 23, Ill.

For More Details Circle No. 412—Page 151

VENTILATING FANS

Direct-connected orifice ring fans for ventilation, drying, and smoke and fume removal use an aerodynamic blade design to produce a uniform air pattern. Design of the blade is said to produce a high-pressure characteristic, yet maintain a low noise level. Because the hub is designed to be in equal proportion to the wheel surface, dead spots or partial stalling are eliminated, the manufacturer reports. Each of the 14 models, ranging is size from 12 to 72 in., is available with two, four, six, or eight blades, depending on pressure and volume specifications. Standard motors operate in temperatures up to 120° F; glass-insulated models can be supplied for operations up to 180° F. All units are designed for horizontal or vertical installation.—**Chicago Blower Corp.**, 9863 Pacific Ave., Franklin Park, Ill.

For More Details Circle No. 413—Page 151

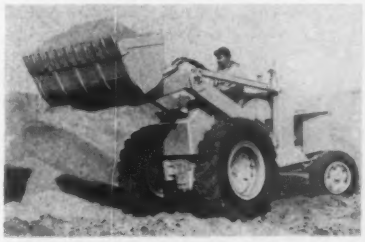
MOBILE CAR MOVER

Improved mobile car mover is equipped with a new power train which includes a new engine and a torque converter-hydraulic transmission combination. The torque converter offers multiplied, smooth application of power, and the hydraulic transmission simplifies gear-ratio changes. The 6-cylinder engine permits the Trackmobile to develop 13,000 lb of drawbar pull, or enough to move several fully loaded freight cars.—**Whiting Corp.**, Harvey, Ill.

For More Details Circle No. 414—Page 151

TRACTOR LOADER

Multipurpose tractor loader has a payload capacity of ⅞ cu yd. The tractor features no-shift, instant re-

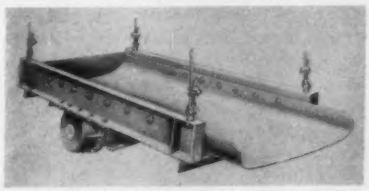


versing to facilitate maneuverability. It has a low pivot point for direct line thrust, but has telescoping arms for extra long reach. A special shock absorber cushions the load on rough terrain and helps keep buckets heaped, it is claimed.—**Massey-Ferguson Industrial Div.**, 1009 South West St., Wichita, Kans.

For More Details Circle No. 415—Page 151

VIBRATING FEEDER

Vibrating feeder is designed to handle hot, abrasive, fine, or lumpy bulk material direct from bin or hopper at a controlled, uniform rate. It is a low-headroom unit with unitized trough construction said to reduce leakage and spillage. Feeder consists of a trough and integral motorized vibrator drive mounted directly on a rugged channel frame. Power is supplied by a motor specially designed for vibrator service with a double-extended shaft on which counterweights are mounted. The feeder can be cable and spring-suspended



under a hopper or spring-mounted on supports from the floor. Twelve sizes are offered in standard widths of 2, 3, and 4 ft and lengths from 5 to 8 ft, with capacities up to 250 tons an hour.—**Link-Belt Co.**, Dept. PR, Prudential Plaza, Chicago 1, Ill.

For More Details Circle No. 416—Page 151

GAS REGULATORS

Single-stage, inverse type regulators for oxygen, acetylene, hydrogen, nitrogen, argon, helium, or carbon dioxide, are engineered to meet flow-rate demands of such operations as heating, heat treating, lead burning, welding, cutting, flushing molten metals, and inert-gas-shielded arc welding. Each of the 8100 series regulators allows low cylinder pressure end points to permit near-complete gas exhaustion from the cylinder.—Made by **Air Reduction Sales Co.**, division of Air Reduction Co., 150 East 42nd St., New York 17, N. Y.

For More Details Circle No. 417—Page 151

WELDING PRODUCTS

Inco-Weld "A" wire is designed to give high-quality automatic and manual inert gas welds in 95 per cent of the dissimilar metal com-

binations encountered in industry. Inco-Hard "1" is an electrode for hard-surfacing steel or cast iron equipment subject to heavy wear and abrasion. Welds from the wire are said to be of x-ray quality and to have high strength, corrosion

resistance, machinability, high impact resistance for subzero applications, and good elevated temperature properties. The protective overlay created by the electrode is structurally similar to nickel-chromium alloy. An example of its application pictured here is as a surfacing for rests on a grinding wheel stand. The overlay is expected to give 8 years of service.—**International Nickel Co.**, 67 Wall St., New York 5, N. Y.

For More Details Circle No. 418—Page 151

BATTERY-POWERED SWEEPER

Electrisweeper features standard automotive cam and lever shockproof steering, foot accelerator with automatic power release, electric forward and reverse control without

shifting gears, fingertip control mounted on steering column for operating hydraulics, master control panel with all switches mounted in front of operator and key lock master switch, foot-operated hydraulic brakes on both rear drive wheels, and manual parking brake.

Dust system with high-volume, impeller-type blower delivers dust into a separator chamber. Filter automatically empties when hopper is dumped. Unit operates for a full 8-hr shift without recharge when two 12-v industrial-type batteries with minimum of 360 amp-hr are used.—**Wilshire Power Sweeper Co.**, 247 Dundee Ave., Elgin, Ill.

For More Details Circle No. 420—Page 151

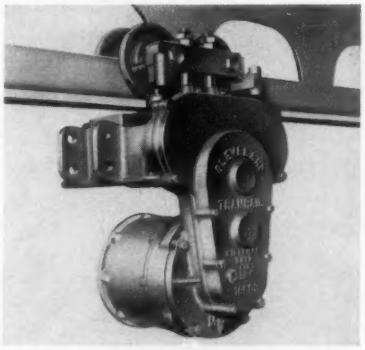
FLOOR-PATCHING MIXTURE

Emeri-Quikpatch is an emery-based, nonresilient floor patching material for repair of concrete floors, reportedly without danger of softening, rutting, or poor adhesion. It also is said to eliminate absorbency. A plasticizer gives the product good bonding properties. No additive is required except water. Packed in 105-lb drums.—**Walter Maguire Co.**, 60 E. 42nd St., New York 17, N. Y.

For More Details Circle No. 421—Page 151

MONORAIL TRACTOR

Motor-powered tractor for use in overhead monorail handling systems is driven by two 5-in.-diam steel rollers under spring pressure against the bottom of the track. Rubber drive rollers also are available. The tractor is said to develop a drawbar pull of 300 lb. It can be used as a single motor drive for one or more carriers in a train and for motorizing hand-powered cranes and carriers. It may be applied to floor-controlled carriers or cranes, to automatic dispatch units, and to platform or cab-operated carriers or cranes. It is especially adaptable for systems that have inclined tracks. Minimum speeds are 50 fpm with a ½-hp motor, 75 fpm with a ¾-hp motor, and 100 fpm with 1, 1½, or 2-hp motors. Maximum speed is 350 fpm. A power and free attachment



permits temporary release of pressure on the drive rollers, allowing tractor to be pushed by hand.—**Cleveland Crane & Engineering Co.**, Wickliffe, Ohio.

For More Details Circle No. 422—Page 151

BLOWERS AND GAS PUMPS

Company has substantially increased capacity ratings in its full line of type AF rotary positive blowers and type XA rotary positive gas pumps. Type AF blowers are supplied in 18 sizes and capacities to 920 cfm for service from 1 to 10 lb pressure. Type XA gas pumps are available in 18 sizes and capacities to 880 cfm for service from 1 to 7 lb pressure. Dimensions, weights, and design features have not been changed.—**Roots-Connersville Blower**, 1200 Mount St., Connersville, Ind.

For More Details Circle No. 423—Page 151

HYDRAULIC SPEED REDUCER

Hydraulic speed reducer features output speed instantaneously reversible in either direction from 0 to 750 rpm. It can be used for any applications requiring continuous reversing operations and is driven with any ¼ to 1½-hp motor. Reversing is independent of speed control. Speed selection is obtained by rotation of a handwheel, thus giving an infinite number of available speeds through the entire range. The unit consists of a variable displacement hydraulic pump driving a fixed displacement hydraulic motor with a recommended maximum input speed

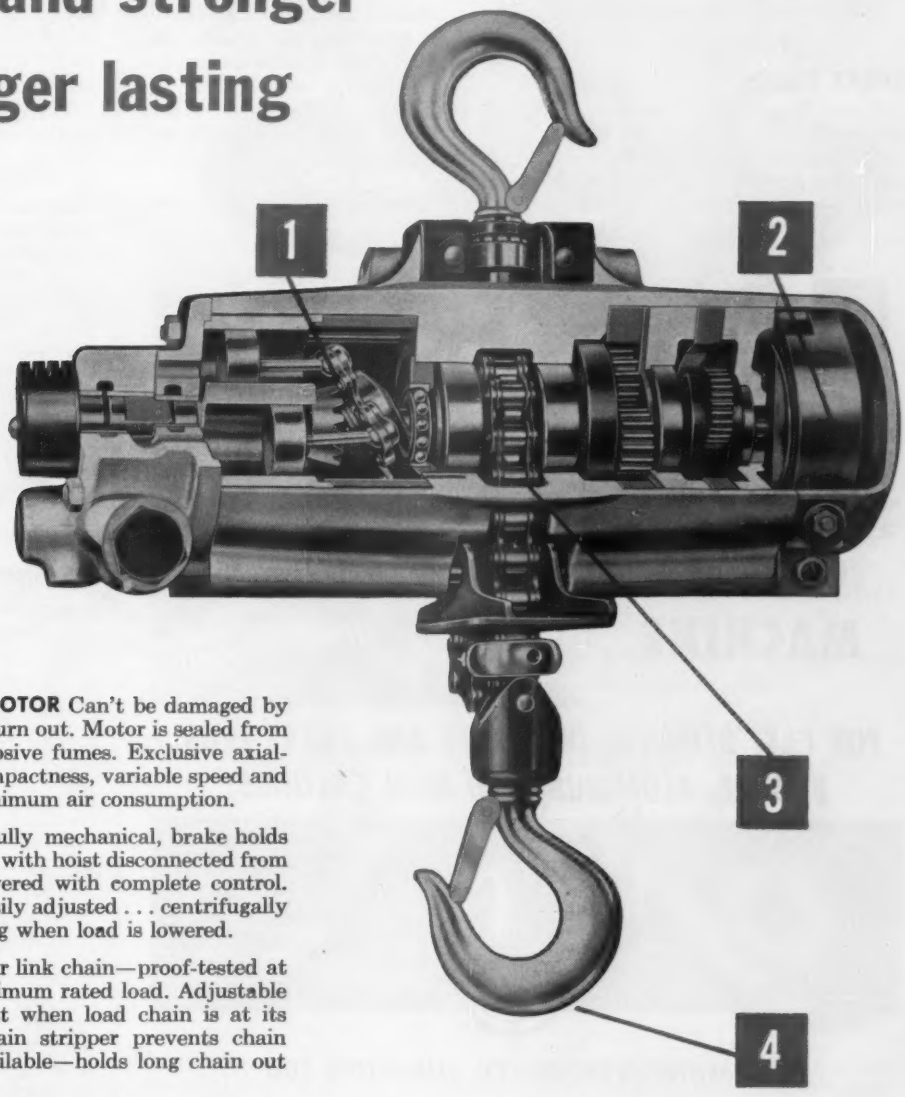
Three-Wheel Fork Trucks Tote up to 3000 lb

Line of three-wheel, gas-powered fork trucks includes five basic models in capacities of 1500 to 3000 lb. The trucks feature a long-life clutch consisting of a mechanically simplified 3 to 1 gear reduction between engine and transmission. Because it operates at one-third engine speed, the clutch is said to be subjected to less wear and to provide lurch-free operation. The clutch is designed to operate without frequent need of lubrication or adjustment. Other new features include hydraulic brakes that require no adjustment for life of lining, a simplified four-point lubrication system that is said to eliminate over 40 per cent of lubrication requirements, and planetary 27 to 1 ratio steering.—

Mercury Mfg. Co., a subsidiary of **Pettibone Mulliken Corp.**, 4700 West Division St., Chicago 51, Ill.

For More Details Circle No. 438—Page 151

Why Gardner-Denver Air Hoists are safer and stronger —longer lasting



1. AXIAL-PISTON AIR MOTOR Can't be damaged by overload stalls . . . can't burn out. Motor is sealed from outside dirt, dust or corrosive fumes. Exclusive axial-piston design provides compactness, variable speed and maximum power with minimum air consumption.

2. POWERFUL BRAKE Fully mechanical, brake holds load in any position. Even with hoist disconnected from air line, load may be lowered with complete control. Brake is fully enclosed, easily adjusted . . . centrifugally governed to prevent racing when load is lowered.

3. LOAD CHAIN Roller or link chain—proof-tested at more than two times maximum rated load. Adjustable safety stops shut off hoist when load chain is at its maximum safe limit. Chain stripper prevents chain fouling. Chain basket available—holds long chain out of the way.

4. SAFETY HOOK Made of forged steel . . . ball-bearing-mounted for swiveling to accommodate load in any position. Safety latch prevents load from slipping off hook. Provision for secondary safety cable in upper hook boss.

Get the lift and the power and the speed you need—with *built-in* safety. Choose from Gardner-Denver's wide variety of lightweight, easy-to-use Keller air hoists. Write for Bulletin 86.

Model	Capacity	Speed	Weight	Hook to hook
86-2V40	4000 lb.	10 f.p.m.	100 lb.	23½ in.
86-2V20	2000 lb.	19 f.p.m.	78 lb.	19½ in.
86-2V10	1000 lb.	38 f.p.m.	78 lb.	19½ in.
86-1V10	1000 lb.	19 f.p.m.	28 lb.	14 in.
86-1V5A	500 lb.	38 f.p.m.	28 lb.	14 in.
86-1V3	300 lb.	80 f.p.m.	28 lb.	14 in.
86A-1	150 lb.	45 f.p.m.	14 lb.	.....

ENGINEERING FORESIGHT—PROVED ON THE JOB
IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

Circle 623 on Page 117

of 750 rpm. It is self-contained in a sealed, 2-qt capacity aluminum oil reservoir with separate controls for speed variation and reversing.—**Roberts Electric Co.**, 849 W. Grand, Chicago 22, Ill.

For More Details Circle No. 424—Page 151

SPRAY BOOTH

Spray booth called Hydrex employs a series of spray jets which create a jet of air through the booth and also provide a turbulent water mist which precipitates dust and overspray from the air. All air movement through the booth is accomplished by jet action of the nozzles. The spray mist mixes with, surrounds, and drags down the paint particles, causing them to precipitate. Precipitated overspray is collected in a reclamation chamber and can be reclaimed by conventional methods. Water for the spray jets is contained in a closed system and is circulated by a small pump and motor attached to the side of the booth.

The booth is available in a number of standard sizes for both hand and automatic spraying. Provisions can be made for the use of conveyors or other mechanical handling devices.—**Schweitzer Equipment Co.**, 3764 Ridge Rd., Cleveland 9, Ohio.

For More Details Circle No. 425—Page 151

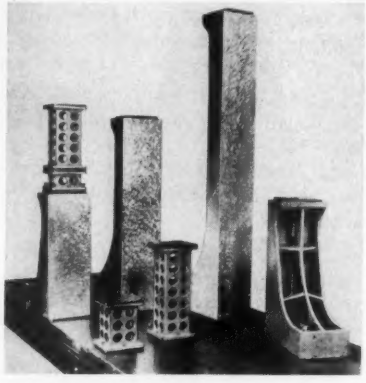
SAFETY SHOE

Three independent steel plates overlap up the front of this safety shoe to extend steel toe protection to the entire forepart of the foot. A "floating bridge" over the ball joint flexes with the foot and permits normal walking comfort. An extended wing protects the small toe area. Ball joint and instep shields are coated with vulcanized Neoprene to resist severe abrasion. The instep shield buckles over the lacing and cannot be removed from the shoe. Heavy duty, oil-resistant Neoprene-cork outsole and heel provide skid resistance.—**Lehigh Safety Shoe Co.**, Emmaus, Pa.

For More Details Circle No. 426—Page 151

MAGNESIUM ANGLE PLATES

Lightweight, magnesium angle plates designed to provide pattern-makers and designers with an accurate level at any desired height have hardened steel runners on the base so they can be used on steel surface plates without wearing. They also are provided with 8 x 8-in., hardened steel plates to which standard magnesium height blocks can be fixed for increasing height.



Four standard heights of angle plates are available: 24, 30, 48, and 72 in. Special units up to 120 in. in height can be supplied.—**Challenge Machinery Co.**, Grand Haven, Mich.

For More Details Circle No. 427—Page 151

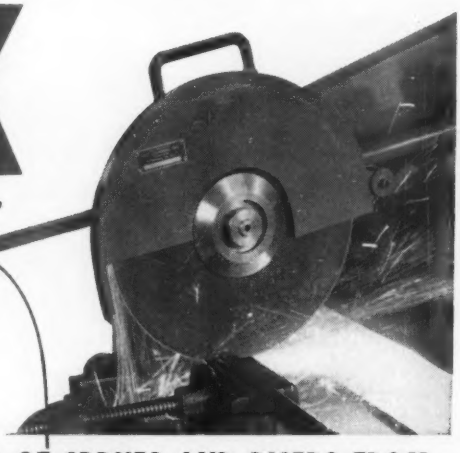
PROTECTIVE MITTS

Heat and abrasion-resistant reversible mitt combines resilient glass

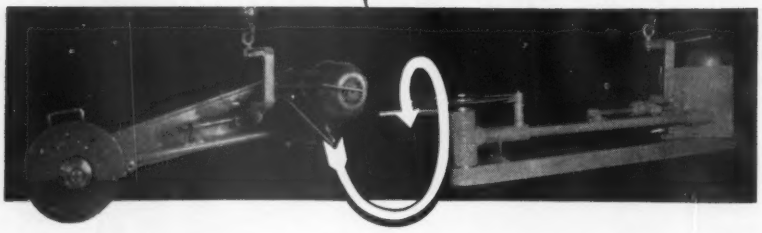
FOX

SWING FRAME

CUT-OFF MACHINE



FOR FAST REMOVAL OF SPRUES AND RISERS FROM BRONZE, ALUMINUM AND IRON CASTINGS!



FULL MANEUVERABILITY THROUGH 180°

The new Fox Swing Frame Cut-Off Machines have been designed to take advantage of the new type "flexible" cut-off wheels. The machine has full maneuverability through 180°. It is especially recommended for the removal of sprues and risers from bronze, aluminum and iron castings.

Available in two sizes, 16" and 20". Write for Catalog!

FOX GRINDERS, Inc.

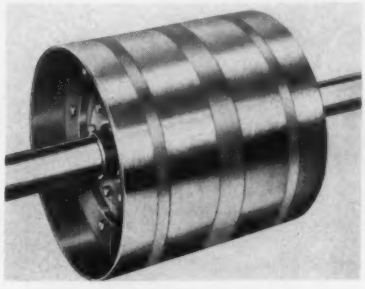
OLIVER BUILDING PITTSBURGH 22, PA.

fibre insulation with processed asbestos. It is claimed that there is no need to change mitts due to heat buildup. In use where metals at temperatures of 800° F with jagged risers were handled, the mitts gave good protection against heat and showed good abrasion resistance.—**Fyrepel Products Inc.**, Newark, Ohio.

For More Details Circle No. 428—Page 151

MAGNETIC PULLEYS

Ceramic permanent magnets, said to be effective in removing tramp iron from fast-moving con-



veyor burdens, are used to energize newly designed pulleys. The high performance claimed for the pulleys is due to the radial pole design of the magnet assembly. The permanent magnet pulleys are offered in standard widths from 12 in. up, and in diameters of 12, 15, 18, 20, and 24 in. Larger sizes are available.—**Stearns Magnetic Products,** 635 South 28th St., Milwaukee 46, Wis.

For More Details Circle No. 429—Page 151

STRESS-STRAIN CURVES

Converter unit, when attached to an electronic recorder, converts signals from SR-4 strain gages into a usable voltage to drive the recorder chart in direct proportion to specimen strain. The known gage factor for the strain instrument is set and the test conducted in the normal manner. A stress-strain curve automatically is plotted by the recorder. A flip of the selector switch on front of the converter permits routine recorder operation without signal conversion.—**Tinius Olsen Testing Machine Co.**, 8034 Easton Rd., Willow Grove, Pa.

For More Details Circle No. 430—Page 151

SPECTROGRAPH

An interchangeable direct-reading attachment to the company's high-resolution 3-meter grating spectrograph permits use of the instrument for routine control as well as for

Foseco® COVERALS AND NEW, HIGHLY EFFICIENT DEGASERS

ELIMINATE PINHOLE POROSITY AND OXIDES IN ALUMINUM CASTINGS . . .

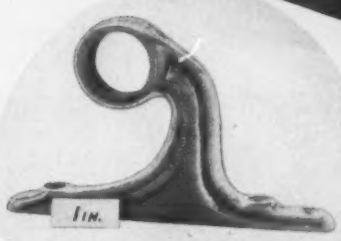


Photo shows pinhole porosity which resulted with untreated aluminum alloy casting.

This photo shows how pinhole porosity is eliminated completely when casting is treated with Foseco COVERALS and DEGASERS.

Save you wasted time and materials

- Speedily removes hydrogen from all aluminum alloys
- Minimizes oxidation
- Helps remove dirt and non-metallics from the melt
- Produces drosses low in metal content
- Prevents oxide build-up in furnaces
- Easy to use
- Inexpensive

Efficient Foseco Coverals and *new* Foseco Degasers, more efficient than ever, are available for use in all types of melting furnaces, and for treating *all* aluminum alloys.

Foundry Services, Inc. maintains a continuing research and development program to create more efficient products to insure you high quality metals at a low cost. Consult us for assistance on any of your metal treatment problems. We can help you improve product quality as well as save you time and money.

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Send this coupon for free leaflets giving all the facts about treating aluminum alloys.

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Company_____

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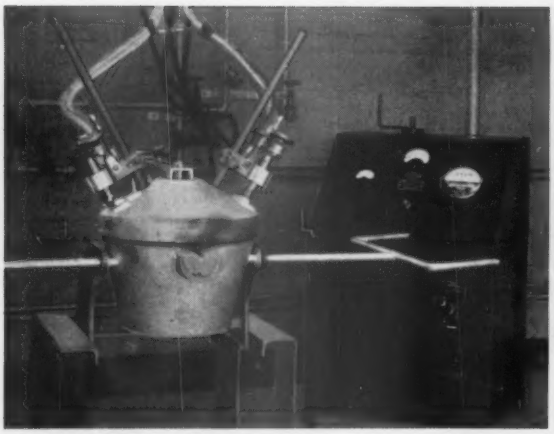
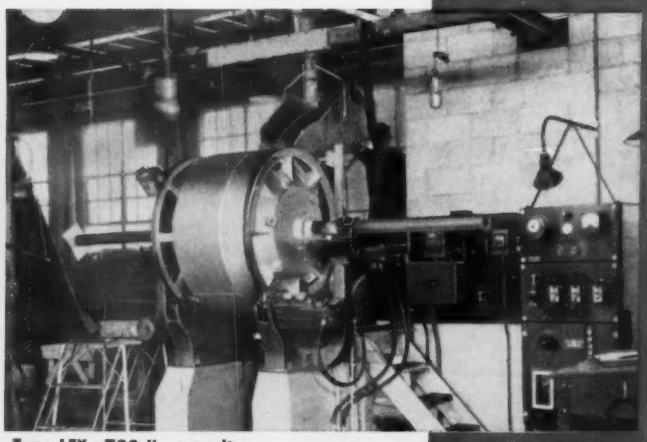
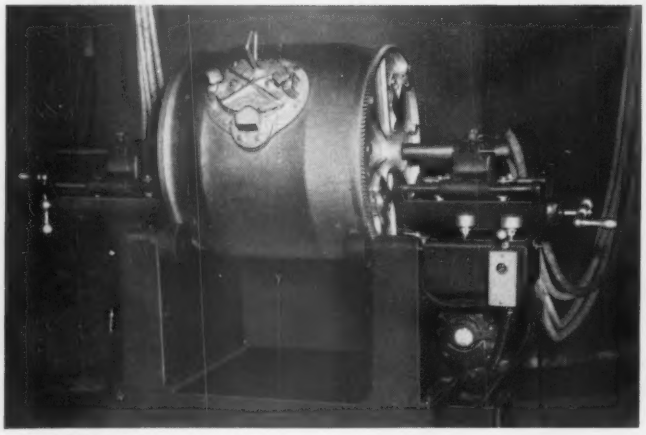
City_____ State_____



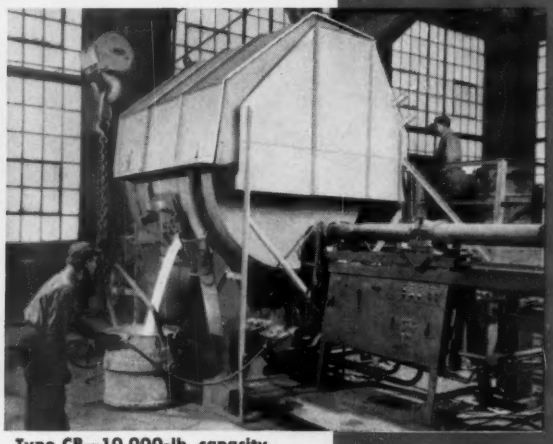
Type PT—15-lb. capacity



Type LFY—700-lb. capacity



Type GMS—60-Lb. and 100-Lb. capacity



Type CP—10,000-lb. capacity

DETROIT ROCKING ELECTRIC FURNACES

can melt metal efficiently for you, too

The list on the opposite page testifies to the versatility of these great furnaces. Hundreds of high quality products, in bronze, brass, iron and ductile iron, are cast from the efficient flow of metal produced by Detroit furnaces.

The indirect arc, free of the molten metal at all times, produces alloys of precise analysis in melt after melt. Rocking action results in maximum heat transfer, optimum utilization of power.

Detroit Rocking Electric Furnaces are capable of doing many jobs well. One furnace, equipped with extra shells, can melt a variety of metals and alloys. Interchange of shells is quick and easy, and the savings in installation work, transformers, wiring and floor space is large and important.

Capacities of Detroit Electric Furnaces range from 10 to 10,000 pounds.

Send us your operating data. Let our engineers show you how a Detroit Electric Furnace will meet your needs.

MEMBER FEMA

DETROIT
Kuhlman

Foreign Representatives: in BRAZIL—Equipamentos Industrias, "Eisa" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway,

ATTRITION MILLS AND GRINDING PLATES . . . BERYLLIUM COPPER MASTER ALLOYS . . . BRASS AND BRONZE PLUMBING GOODS . . . BRONZE BEARINGS AND BUSHINGS . . . BRONZE TEXTILE MACHINE PARTS . . . COAL STOKER PARTS . . . DIALS AND GAUGES . . . DIES . . . DUCTILE IRON PARTS FOR CEMENT MIXERS, LAWNMOWERS AND ORDNANCE MATERIAL . . . HIGH STRENGTH IRONS FOR AUTOMOTIVE PARTS . . . JET ENGINE PARTS . . . MALLEABLE IRON AGRICULTURAL IMPLEMENTS . . . MASTER ALLOYS AND INOCULANTS . . . NAVAL ORDNANCE BRONZES . . . NICKEL ANODES . . . OIL WELL PUMP LINERS . . . PARTS FOR ELECTRICAL PRECIPITATORS . . . RECOVERY PROCESSING OF METALLIC DROSSES . . . SPECIALTY STEELS . . . TOOL STEELS . . . TOOLS . . . WELDING ROD ALLOYS.

ELECTRIC FURNACE DIVISION

Electric Company, Bay City, Michigan

New York 7, N. Y.; MEXICO: Cia Proveedora de Industrias, Atenas 32-13, Apartado 27A3, Mexico 6, D. F., Mexico; EUROPE, ENGLAND: Birlec, Ltd., Birmingham.

Circle 626 on Page 117

Are you at home when it comes to a quality melt ?

Chief Keokuk decided to tutor his tot on tepee building. But Junior sees how a saw can solve the situation! Lo, the poor Princess! Now she's sole occupant of the first trimmed tenement in tribal history.

BE RIGHT AT THE FRONT DOOR WHEN IT COMES TO QUALITY

and low-cost production. Just choose Keokuk Silvery Pig Iron, every time! The superior form of silicon introduction, it's the sure way to get an even distribution in every melt. Handle by magnet, furnace-charge by weight, or count the pigs for equal accuracy. Aluminum producers, put out the welcome mat for Keokuk Silicon metal.

Keokuk Electro-Metals Company, Keokuk, Iowa;
Wenatchee Division, Wenatchee, Washington

KEOKUK **SILVERY PIG IRON**
SILICON METAL—OTHER FERROALLOYS

When you think of SILICON think of KEOKUK!

SALES AGENT: MILLER AND COMPANY
332 S. Michigan Avenue, Chicago 4, Illinois
3504 Carew Tower, Cincinnati 2, Ohio
8230 Forsyth Blvd., St. Louis 24, Missouri

Keokuk Silvery Pig—the superior form of silicon introduction—is available in 60 and 30 lb. pigs and 12½ lb. piglets in standard analysis or alloyed to your specifications. Silicon metal and ferro-silicon are supplied in standard sizes and analyses.

research. The combination is said to provide fast, accurate dial-read-out-analyses on routine samples while allowing for rapid changeover to the unlimited range possible with spectrography. The direct-reading attachment reportedly presents, as per cent concentration, readout of eight elements in less than two minutes. An automatic optical servo monitor corrects angular deviations of less than ¼ second of an arc.—**Baird-Atomic Inc.**, 33 University Rd., Cambridge 38, Mass.

For More Details Circle No. 431—Page 151

REFRACTORY WASHES

Three new refractory washes may be used on shell, CO_2, air set, or oil-bonded cores and molds in ferrous or nonferrous foundries. The washes may be applied by brushing, dipping, spraying, or swabbing. Zircon wash 973 and ceramic wash 974 are water-soluble white powders which may be torch or oven dried. No. 995 is a blended plastic refractory wash soluble in water or alcohol. — **Archer-Daniels-Midland Co., Federal Foundry Supply Div.**, 2191 West 110th St., Cleveland 2, Ohio.

For More Details Circle No. 432—Page 151

WORK GLOVES

A seamless thumb that eliminates seams from work-contacting surfaces on and between thumb and forefinger is featured on a new line of work gloves. Improved safety, comfort, and glove life are said to be major benefits of the glove design. Seamless thumb gloves are available in two heavy-duty leather palm

types with choice of safety cuff or gauntlet in each.—**Boss Mfg. Co.**, Kewanee, Ill.

For More Details Circle No. 433—Page 151

EPOXY RESIN COMPOUNDS

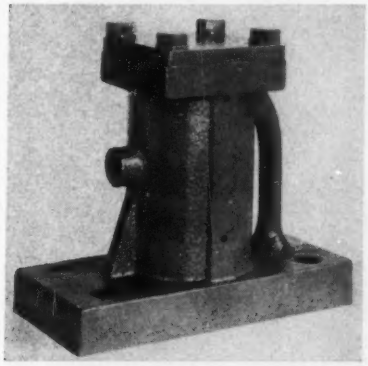
Kit contains 17 yd of 4-in. glass tape, six units each of epoxy resin and hardener, the necessary mix-

ing cups, paddles, and instructions, and a set of tubes containing aluminum epoxy cement. The cement hardens chemically with little shrinkage, it is claimed. It is said to adhere to most metals, wood, and glass, and is oil and waterproof and machinable. The materials are designed for repair work where epoxy resin compounds are applicable.—**Smooth-On Mfg. Co.**, Jersey City, N. J.

For More Details Circle No. 434—Page 151

HOPPER VIBRATOR

One-piece pneumatic vibrator for bins and hoppers has an integral striking plate that cannot separate and leak air, it is claimed. The



one-piece design eliminates body assembly bolts and housing springs. Pistons are not grooved, thus cannot collect pipe scale and oil emulsions. They are well suited for operation in hazardous atmospheres, under extreme moisture conditions, for outdoor applications, and for magnetic dust locations. The vibrator is made in five piston sizes from $1\frac{1}{4}$ to 4 in. for bin, hopper, chute, railroad car, and batching applications.—**National Air Vibrator Co.**, 2372 West Seventh St., Cleveland 13, Ohio.

For More Details Circle No. 435—Page 151

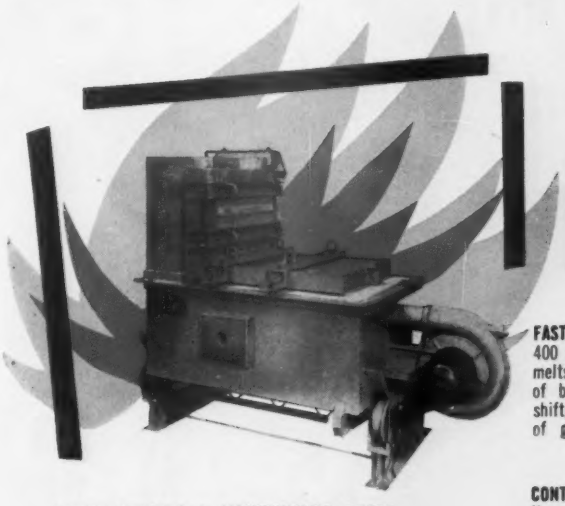
OXYGEN DETERMINATION

A conductometric oxygen analyzer for determination of oxygen in steel, titanium, tungsten, and other metals and alloys is said to be capable of producing complete analyses in 5 minutes with an apparatus range of 0 to 0.035 on the basis of a 1-gram sample. The range can be extended by use of fractional weight samples. Sensitivity of the instrument is 0.0002 per cent oxygen, it is claimed.—**Laboratory Equipment Corp.**, St. Joseph, Mich.

For More Details Circle No. 436—Page 151

SAVE $ WITH REDA FURNACES

FUEL SAVINGS UP TO 50% REPORTED USING REDA GAS-OIL FIRED FURNACES!



BEST HEAT EFFICIENCY

FASTER MELTING — One 400 series Reda Furnace melts up to 11,000 lbs. of brass or bronze per shift, and up to 6,000 lbs. of gray iron per shift.

LOWER MELTING & MAINTENANCE COSTS— One man can operate a Reda Furnace . . . No daily repairs needed!

CONTINUOUS POURING — No waiting until floors, flasks, boards, etc. are filled with molds!

FURNACE DIVISION WRITE TODAY FOR DESCRIPTIVE BULLETIN

REDA PUMP COMPANY - BARTLESVILLE, OKLAHOMA

Circle 628 on Page 117

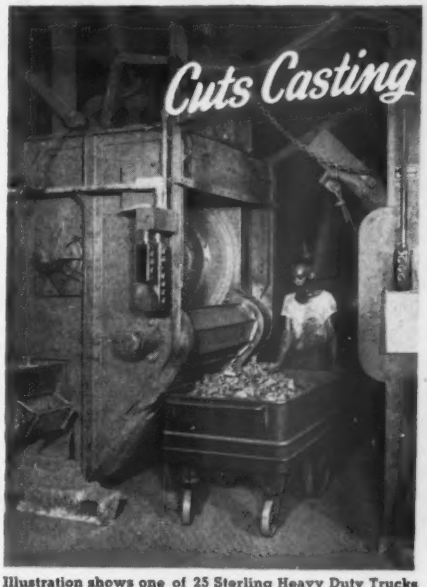


Illustration shows one of 25 Sterling Heavy Duty Trucks in daily use at the Green Foundry, St. Louis, Mo.

Handling Costs!

Sterling Heavy Duty All-Steel Trucks are ideal for transporting castings from Wheelabrator, Roto Blast or similar equipment. 2000 lbs. capacity. Reduces number of loads required. Saves both time and labor. Height is adjustable to accommodate discharge door. Roller bearing wheels and ball bearing swivel casters increase maneuverability. Sturdy, reinforced welded construction. Ask for Cat.

STERLING NATIONAL INDUSTRIES, Inc.

Founded 1904 as Sterling Wheelbarrow Co.

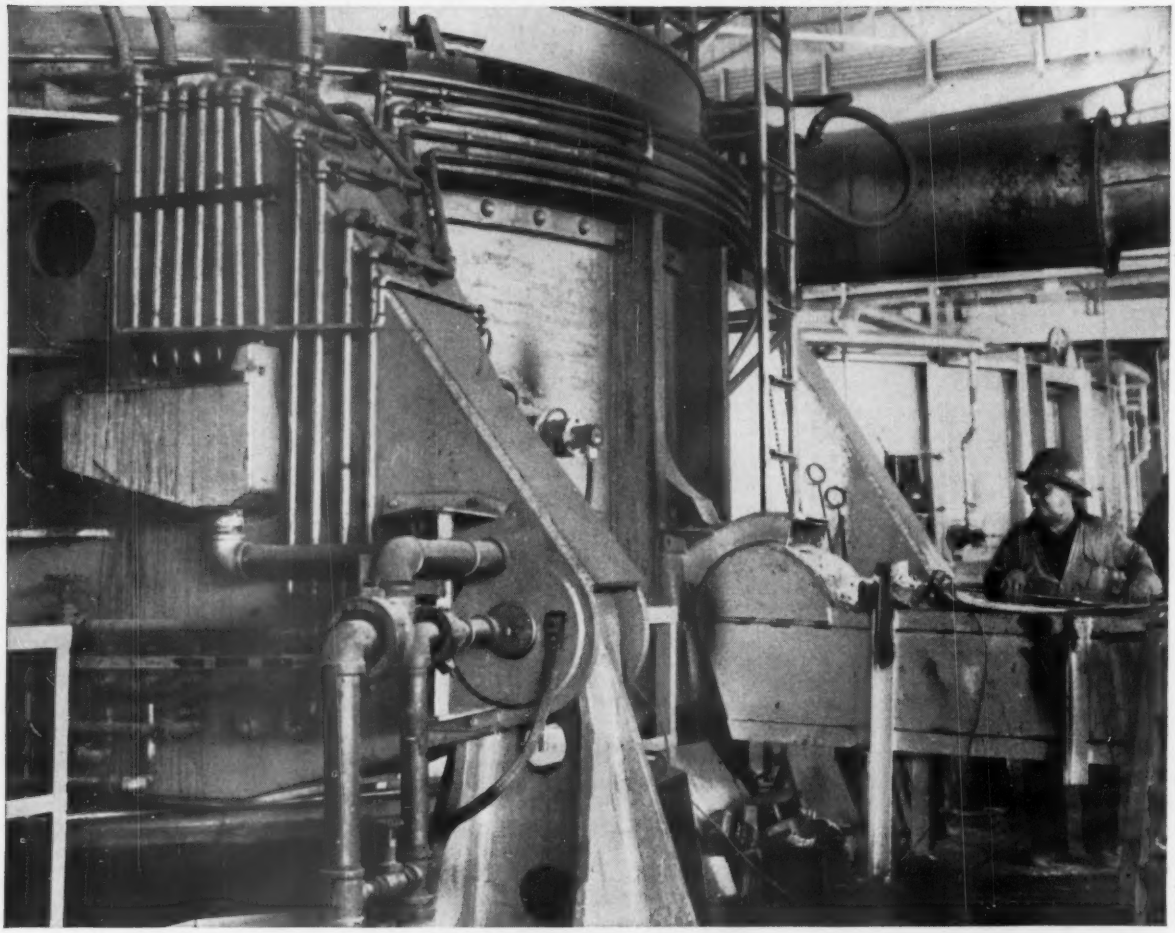
Milwaukee 14, Wisconsin, U.S.A.

Sterling

FOUNDRY EQUIPMENT

A 5656-1/R

Circle 629 on Page 117



From the World's Largest Copper-Melting Electric Furnace

TOP QUALITY CASTINGS...ROCK BOTTOM COSTS

Whiting Hydro-Arc Electric Furnace at the Perth Amboy, N. J. plant of American Smelting and Refining Company pours a ton of copper every two minutes—24 hours a day, 7 days a week. Operating costs are competitive, even in this area of high-priced electric power.

Hydro-Arc offers you the *precise* temperature control that assures a top quality product—be it copper, iron, steel, or any other metal or material. You will save money, too, because continuous melting boosts production . . . top-charging reduces downtime . . . simplified design cuts maintenance costs . . . and Hydro-Arc costs less installed than other equipment of equal capacity. For prime melting or duplexing get the facts on Hydro-Arc.

SEND FOR NEW 8-PAGE BULLETIN EF-100

telling all about the electrode arm and clamp which floats on a cushion of air and which is clamped by a cushion of air. Booklet is fully illustrated. *Whiting Corporation, 15607 Lathrop Avenue, Harvey, Illinois.*

Member of the Foundry Equipment Manufacturers Association

87 OF AMERICA'S "FIRST HUNDRED" CORPORATIONS ARE WHITING CUSTOMERS

WHITING

FOUNDRY EQUIPMENT

MANUFACTURERS OF CRANES; TRAMBEAM HANDLING SYSTEMS; TRACKMOBILE; FOUNDRY, RAILROAD AND CHEMICAL PROCESSING EQUIPMENT

Obituary

STEVENS H. HAMMOND, 47, board chairman, Whiting Corp., Chicago, died Apr. 28 in Chino, Calif. where he had made his home for five years. He had been associated with the company

STEVENS H. HAMMOND

since 1923 when he worked as office boy during summer vacations. He became manager of the appliance division, director of the field sales force, and in 1944 was appointed vice president. The following year he was named Whiting's president and chairman of the board in 1951. Mr. Hammond was a past director of the Foundry Equipment Manufacturers' Association.

James W. Wolfe, 66, former executive secretary-treasurer, Nonferrous Founders' Society, Chicago,

JAMES W. WOLFE

died April 29, following a heart attack at his home in Cassville, Mo., where he had lived since his retirement in 1956. A native of Ironton, Ohio, Mr. Wolfe managed foundries in the Midwest, prior to joining the society in 1945 as field representative. He established its first national office in Chicago. During the Korean War he represented the society in Washington, and in 1956 was honored at the NFFS annual banquet for his efforts and devotion to the society and the nonferrous castings industry.

Hamilton Garnsey Jr., 56, vice president-general manager, Goulds Pumps Inc., Seneca Falls, N. Y., died April 26. He joined the company following graduation from Cornell University in 1923. He became works manager, a director in 1932, and had been vice president since 1938.

Langdon S. Barron Sr., 74, owner, Alpha Brass Foundry Co., St. Louis, died April 6. He left the teaching profession to go into the patternmaking business and started the foundry in 1940.

Rudolf C. Kussat, founder and owner, Atlas Pattern & Model Works, Brooklyn, N. Y., died March 23 in Sarasota, Fla. He founded the company in 1916.

Dr. George V. Slottman, 54, vice president of research and engineering, Air Reduction Co., New York, died Apr. 21.

Work Simplification Films Are Available from IMS

Industrial Management Society, 330 South Wells St., Chicago 6, has published its 1958 edition of the IMS film rental catalog. More than 70 films describing American work simplification and industrial engineering techniques are described. All have won awards in the annual Methods Improvement Competition which is sponsored by the society.

Approximately 10 to 15 minutes long in running time, the films picture before and after phases of training methods and work simplification projects in plant and office operations. The folder, which explains the terms by which the 16-mm films are available for rental, is available on request from Industrial Management Society.

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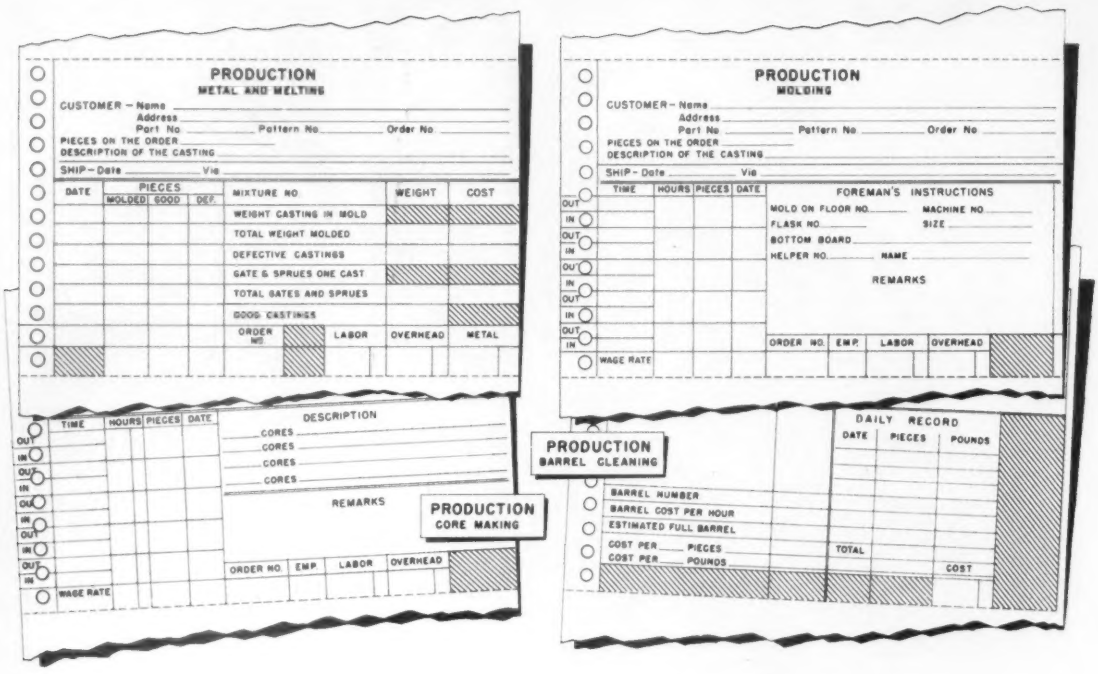
Circle 631 on Page 117



A separate production order should be prepared for each operating division of the foundry. Tops of all forms are the same, but bottoms vary as shown

ACCUMULATING JOB COSTS

In the Gray Iron Foundry

This article concludes the series on cost accounting which began in Foundry for November, 1957. It presents a simple and comprehensive method of accumulating, calculating, and recording operating costs

By **ALBERT E. GROVER**
Cost Consultant
Cleveland

PRODUCTION of gray iron castings usually requires these operations: 1. Preparation of charges for melting. 2. Melting and conveying molten metal to molds. 3. Coremaking. 4. Molding. 5. Barrel cleaning. 6. Hand cleaning. Performance of these operations requires the use of land, buildings, equipment, and personnel.

The purpose of cost accounting is to measure all cost elements related to these activities and to apply them to the jobs produced in an orderly and sensible fashion. Proper control of the activities of a small gray iron jobbing foundry demands careful consideration of each of its costs, which must be charged to the operation responsible.

There are different methods of accumulating, calculating, recording, and reporting cost information. Some foundries have established procedures adequate for their needs, but others have leaned so much toward simplicity of operation that the results are of no use. Results must be accurate, and they must be obtained economically. This article presents a method of accumulating, calculating, recording, and reporting operating costs that is both comprehensive and simple to understand and operate.

A Form for Each Division—When instructions to proceed with a job are received from a customer, a production order is prepared in the form of a separate sheet for each operating division of the foundry. Separate forms are required because of the diversity of information necessary to calculate costs of the various departments. Each is provided with spaces for reporting of cost data necessary to calculate and tabulate costs related to each operation.

Since the information on the upper section of the sheet is the same for each operation, that information first is entered on any one of the forms and mechanically duplicated on the others. There are two primary objectives for duplicating: 1. The time saved in the foundry in writing this information on any form that may be used to report data for calculating costs. 2. To avoid mistakes often made in re-

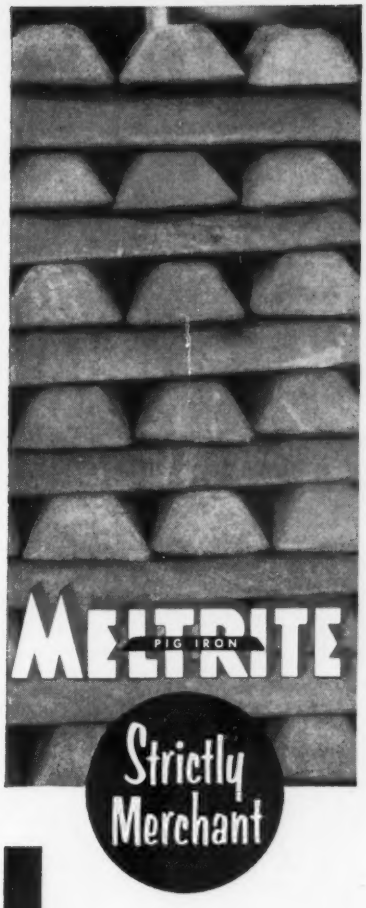
porting the wrong information, thus causing confusion and loss of time in the accounting department.

Metal and Melting—So that differentials in the costs of metals required by the various jobs may be reflected in the final cost of the jobs, tables are prepared for the cost of each mixture. These tables are used to calculate the material costs of jobs.

Another form is used to record the number of pieces molded, weight of defective castings, weight of gates and sprues for the individual casting, and number of good and defective castings produced. The foundry clerk records this information for each day's production. At the completion of the job, the sheet is delivered to the cost department. for cost calculation. Should the job be uncompleted at the close of the pay period, the cost sheet is delivered to the cost department, and a new sheet prepared for further recording of operating data. This procedure is repeated, if necessary, until the order has been completed.

When the sheet is received in the cost department, the cost clerk calculates the cost and makes appropriate entries:

1. The numbers of molded, good, and defective pieces are added and the sums of each are entered at the bottom of the sheet.
2. The number of molded pieces is multiplied by the weight of the casting in the mold, the result being entered under "weight."
3. The number of molded pieces is multiplied by the weight of the gates and sprues in the mold, the result being entered under "weight."
4. The weight of molded castings (including the weight of gates and sprues) is multiplied by the cost of metals and melting supplies previously established for the mixture used for that particular casting, and the result entered in the "cost" column.
5. The weight of defective castings is multiplied by the per-pound value and the result is entered in the "cost" column.
6. The weight of gates and sprues is multiplied by the per-pound value and the result is entered in the "cost" column.
7. The combined weights of defective castings and gates and sprues deducted from the total weight in the molds is the weight of good castings. Likewise, the cost of defective castings and gates and sprues deducted from the cost of metal in the molds is the cost of good castings, the result being entered in the



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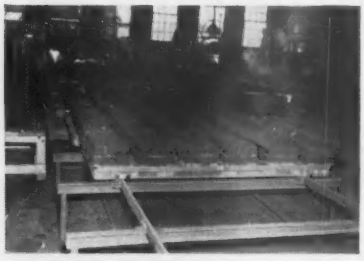

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Circle 634 on Page 117

"metal" space at the bottom of the sheet. The sheets then are filed in an open file by order number, pending final cost determination at the close of the pay period.

Coremaking—The multiplicity of cores needed for various castings makes it necessary to register elapsed time for every core operation, such as forming, repairing, pasting, assembling, etc. Sometimes repairing and pasting are so general in nature that it is more practical to include the costs of these operations in overhead. Costs of forming and assembling are, however, always timed.

When all the cores needed for a single order for castings are to be produced as needed for the molding operation, the elapsed time is not recorded for each kind of core. But the time is recorded for each kind of core that is intended to be used in future molding operations. These are called stock cores.

The in-and-out times may be recorded either manually or mechanically, in hours and fractions of hours. Pieces and dates also are recorded. The coremaking sheets are delivered to the cost department for completed jobs or at the close of the pay period. New sheets are prepared as needed for further registration of time and pieces. The later two points also apply to forms for each of the subsequent operations.

Molding—Since the molding sheet is an order for performance, the foreman's detailed operating instructions are entered in space provided, with any special remarks about the job.

The in-and-out time is recorded either manually or mechanically, and the elapsed hours are determined and recorded. The number of pieces molded and the date also are recorded.

Barrel Cleaning—The cost of barrel cleaning the many sizes and shapes of castings is difficult to obtain. Because recording the time of the employee loading and unloading the barrel is never related to the time the castings are tumbled, it becomes necessary to use another method, as described on page 90, of FOUNDRY, February, 1958.

Information recorded in the cleaning department consists of the barrel number, estimated full barrel, date, and either pieces or pounds in the barrel, considering whether pieces or pounds are commonly used to measure the cost of the operation.

Hand Cleaning — Weight, contour, fragility, size, or a combination of these factors prohibits barrel cleaning of some castings. Therefore, the elapsed time for grinding, chipping, etc., is recorded on the production sheet and forms a basis for determining the hours spent on the operation. The date and pieces processed are recorded on the order sheet.

Extra Costs—Extra costs for pattern work, machining, or other work related to the particular job are timed, and the time and cost are calculated on the production sheet prepared for each of these extra operations.

At the completion of the job, these extra operation sheets like those already described, are delivered to the cost department. As in the other operations, new sheets are prepared for use in recording further information.

At the close of each payroll period (usually one week), the cost department calculates the costs of the several operations on the job and enters the amounts in the designated sections of the forms.

1. Melting labor cost includes cost of preparing iron and melting supplies and melting and pouring for the entire period, prorated to each job on the basis of the weights poured into the molds (including weights of the good castings, defectives, and gates and sprues). Since the operation of preparing metals and supplies and melting and pouring the iron into the molds is directly related to all the iron in the mold, costs of the jobs are charged accordingly. The overhead charge for the melting department is treated like that for labor.

2. The labor cost for coremaking is determined for jobs performed on an hourly basis by multiplying the total hours by the hourly rate of the employee performing the operation. When cores are made on a piecework basis, the number of pieces produced is multiplied by the established piecework rate. Whether the labor costs are determined on a daywork or piecework basis, the overhead cost is determined by multiplying the elapsed hours by the established hourly rate for the coremaking department.

3. The labor cost for molding is determined for jobs performed on an hourly basis by multiplying the total hours by the hourly rate of the employee performing the operation. When molds are made on a piecework basis, the number of pieces produced is multiplied by the established piecework rate. Whether the labor costs are determined on a daywork or piecework basis, the overhead cost is determined by mul-

tiplying the elapsed hours by the hourly rate for the molding department or by the hourly rate established for a cost center within the department.

4. The first step in calculating the cost of barrel cleaning is to combine the labor cost of the department with the applicable overhead. This over-all cost is prorated to individual barrels on the basis of time each unit was operated. The prorated cost of each barrel divided by the time it was operated results in the hourly cost to operate the barrel. The next step is to divide the hourly cost by the estimated number of pieces or pounds cleaned for each order. The result of this calculation is entered in the "cost" section at the bottom of the sheet.

5. The labor cost for hand cleaning is determined for jobs performed on an hourly basis by multiplying the total hours by the hourly rate of the employee performing the operation. When the cleaning is done on a piecework basis, the number of castings cleaned is multiplied by the established piecework rate. Whether the labor costs are determined on a daywork or piecework basis, the overhead cost is determined by multiplying the elapsed hours by the hourly rate for the hand cleaning department.

6. Extra costs for pattern work, machining, or other work related to the particular job are timed. The labor cost is determined by multiplying the elapsed hours by the hourly rate of the employee performing the work. The overhead cost of the job is determined by multiplying the elapsed hours by the hourly rate for the department in which the work was done.

"Slow it down! Slow it down!"

Each operation sheet is punched at its left side to provide a means of lapping them, with the bottom section exposed, for convenient arranging on a pegboard. Thus, all three elements of cost, (labor, overhead, and metal) can be added while the sheets are spread on the board.

Certain accumulations of costs and other operating statistics needed for accounting control can be obtained economically from a tabulation of the information on the bottom section of the operation sheets. This can be accomplished by preparing an accumulation sheet, punched to allow for placing on the pegboard so that the operation sheets can be superimposed thereon so that summaries can be entered on lines provided on the accumulation sheet. By provision of perpendicular lines that coincide with the lines on the detail sheets, summaries can be recorded easily and accurately on the accumulation sheet.

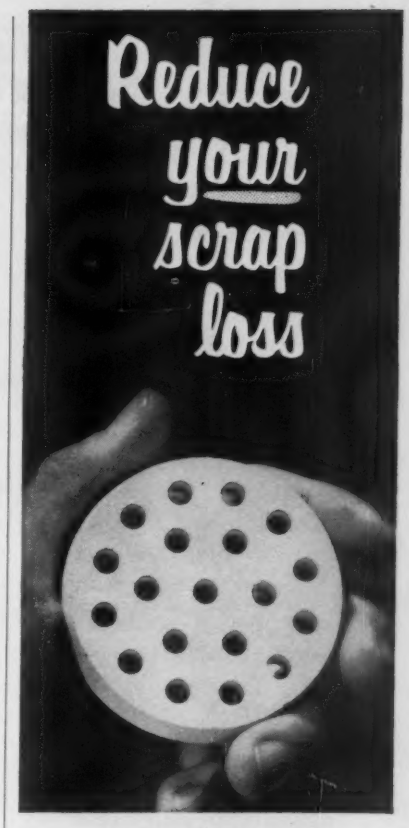
After the necessary summaries for accounting control have been made, the sheets containing information that can be charged directly to a job, are filed, by order number, in an open file.

When castings are delivered and an invoice rendered, the several operation cost sheets are removed from the file and spread on the pegboard in such a manner that the cost and statistical information can be added. Totals are entered on the accumulation sheet on lines provided for recording of individual jobs. The sum of all these entries for the accounting period represents the cost of all the jobs shipped.

At the close of the accounting period, the cost sheets remaining in the file are removed from the file, and labor, overhead, and metal costs are added.

Describes Testing Symbols

American Welding Society has issued a new publication, designated AWS A2.2-58 and titled "Nondestructive Testing Symbols," which describes symbols to be used in specifying nondestructive tests. Supplying a long-felt need, the standard permits use of a single symbol to specify radiographic, magnetic-particle, penetrant, or ultrasonic testing. The nondestructive test-symbols also can be combined with welding symbols to simplify instructions. The book may be obtained for $1 from American Welding Society, 33 West 39th St., New York 18, N. Y.



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Circle 635 on Page 117

Literature for Foundrymen

Induction Furnaces

Publication LL-2 lists technical articles, pamphlets, and advertisements describing characteristics and applications of 60-cycle induction melting furnaces used in ferrous and nonferrous metals industries.—**Ajax Engineering Corp.**, Box 1418, Trenton 7, N. J.

For More Details Circle No. 496—Page 151

Roof Ventilators

Capacity ratings, noise-level classifications, motor selection specifications, and installation notes are covered in Bulletin 2700 on centrifugal power roof ventilators for ex-

haust and supply applications. Accessories also are described.—**ILG Electric Ventilating Co.**, 2850 N. Pulaski Rd., Chicago 41, Ill.

For More Details Circle No. 497—Page 151

Blade Tensioning Chart

Chart, 8½ x 11 in., gives the correct torque wrench readings in inch-pounds for different power hack saw machine and blade combinations. It also shows the new Wachs counted turn method for obtaining the correct blade tension.—**E. H. Wachs Co.**, 1527 North Dayton St., Chicago 22, Ill.

For More Details Circle No. 498—Page 151

Sand Muller

Recently issued eight-page folder describes three sizes of sand mullers designed specifically for cold resin coating of sand but also used for conventional sand preparation. Capacities are 100 to 150 lb in coating, 250 lb conventional; 200 to 300 lb in coating, 400 lb conventional, and 800 to 1000 in coating, 1500 lb conventional. Information on shell molding, operation, and care of equipment is included.—**Shallway Muller Corp.**, Cambridge, N. Y.

For More Details Circle No. 499—Page 151

Welding Wire Chart

Informative and useful four-page folder designated as DH-1218-M, details as-welded physical properties, analyses, and lists typical uses for gas welding rods, bare electrodes, automatic welding wire, and metal spray wire.—**Page Steel & Wire Div., American Chain & Cable Co.**, Monessen, Pa.

For More Details Circle No. 500—Page 151

Plastic Tooling

Bulletin describes the use of plastics for tooling and suggests applications for such tools. Typical tool fabrication methods are illustrated. —**Furane Plastics Inc.**, 4516 Brazil St., Los Angeles 39, Calif.

For More Details Circle No. 501—Page 151

Blast Cleaning

Bulletin 200 describes portable and stationary direct-pressure blast machines in a range of sizes, including an automatic unit. Bulletin 300-A gives specifications for a range of sizes of standard and special blast cleaning cabinets. **Macleod Co.**, Sharonville, Ohio.

For More Details Circle No. 502—Page 151

Indicating Thermometers

Catalog C60-2 describes complete line of Brown rectangular-case, filled system thermometers. Vapor, gas, and mercury-actuated thermometers and thermal systems for use between minus 125 and 1000° F are listed and explained.—**Minneapolis-Honeywell Regulator Co.**, Wayne and Windrim Aves., Philadelphia 44, Pa.

For More Details Circle No. 503—Page 151

Casting Design

Illustrated eight-page brochure featuring important information on designing for investment castings relates to such factors as fillets, holes, threads, wall thicknesses, and tolerances. Ferrous and nonferrous alloys which can be used for investment castings also are discussed. —**Casting Engineers Inc.**, 2323 N. Bosworth Ave., Chicago 14, Ill.

For More Details Circle No. 504—Page 151

Saw Blades

Catalog 7 explains service and savings involved in company's reconditioning of band saw blades for users in all parts of the country. New blade specifications and prices, and prices of other bandsaw machine supplies, are included.—**Industrial Saw Mfg.**, 308 East Oaks Ave., Compton, Calif.

For More Details Circle No. 505—Page 151

C-Clamps

New C-clamp design is incorporated in several series of clamps, including quick acting type and

clamps having extra-deep throat. They are described in Catalog No. 692.—**Wilton Tool Mfg. Co.**, 9525 Irving Park Rd., Schiller Park, Ill.

For More Details Circle No. 506—Page 151

Sand Reclamation

How a sand reclamation system recovers 80 per cent of the sand previously discarded by a midwestern steel foundry is described in Bulletin F14-45. — **Denver Equipment Co.**, Box 5268, Denver 17, Colo.

For More Details Circle No. 507—Page 151

Overhead Cranes

Company's entire line of standard overhead traveling cranes is described in Bulletin 900. Full spec-

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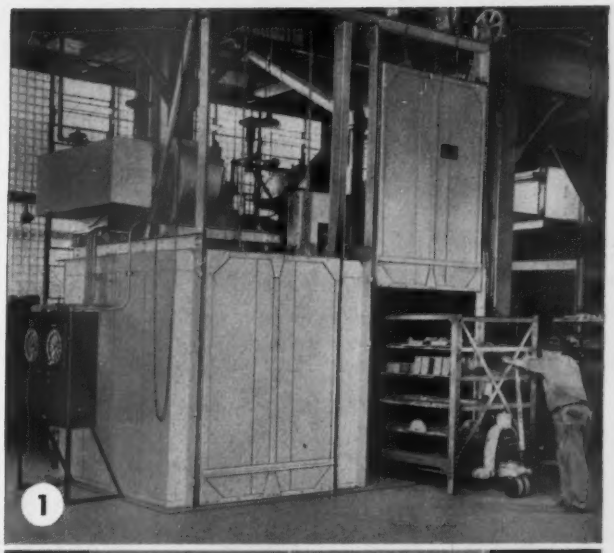

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Circle 636 on Page 117

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Fanner Superchills are superior in the pouring operation because they are scientifically designed to produce proper chilling without "blows" . . . without "kicking away" . . . without defects. The top surface has a tapered point which is enveloped gradually as molten metal rises in the pouring operation . . . allowing ample time for gases to escape before Superchill is submerged and fused. (See cross section).

The *center section* is square so that the Superchill can be placed in a horizontal position in such a way that there is no flat surface at the top but a corner at all times. Square headed tacks in the core box or on the pattern are used to indicate position. Frequently, when a round chill is used, fusion is not complete, and when drilled, the chill turns with consequent breakage. The square Superchill cannot turn . . . and its corners aid in fusion. If you do not have complete information on these exceptional Superchills, write for details today.

- Fine Fanner Superchills are made in a wide variety of sizes and shapes — uncoated or coppered. They provide better surfaces for molten metal to join with and more chilling volume per pound. They have universal use throughout industry.

THE FANNER MANUFACTURING CO.

Designers and Manufacturers of Fine Fanner Chaplets and Chills

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Pacific Graphite Co.
2522 Malt Ave.
Los Angeles, Calif.
Pacific Graphite Co.
40th & Linden Streets
Oakland, California
Snow & Galgiani
533 Second Street
San Francisco, Calif.
Barker Fdry. Supply Co.
120 S. Linden Avenue
S. San Francisco, Calif.

COLORADO
Mine & Smelter Sply. Co.
1422 17th Street
Denver, Colorado

ILLINOIS
Hill & Griffith Co.
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Chicago 50, Ill.
Foremost Fdry. Sply. Co.
Chicago, Ill.
Mail Address:
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Milwaukee, Wisc.
The S. Obermayer Co.
2546 West 18 St.
Chicago 8, Ill.

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Supply & Equipment Co.
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Springfield Facing Co.
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Frederic B. Stevens, Inc.
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Detroit, Mich.
E. J. Woodison Co.
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217 Lombard St.
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Foundry Supply Co.
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St. Louis 10, Missouri

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79 Morgan Parkway
Williamsville, N. Y.

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Goehringer Fdry. Sply. Co.
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Hill & Griffith Co.
1262 State Avenue
Cincinnati, Ohio
Federal Fdry. Sply. Co.
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Cleveland 5, Ohio
Galion Fdry. Spec. Co.
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Fenton Fdry. Sply. Co.
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Dayton, Ohio
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The FANNER MANUFACTURING Co.

Brookside Park

Cleveland, Ohio

Circle 637 on Page 117

ifications are given for double girder and single girder, motor-driven and hand-geared models in capacities from 1000 to 20,000 lb.—**Robbins & Myers Inc.**, Hoist & Crane Div., Springfield, Ohio.

For More Details Circle No. 508—Page 151

Experimental Cupola

Pamphlet describes a 10-in.-diam cupola and test procedure used by Citizens Gas & Coke Utility, Indianapolis, in evaluating the performance of its foundry coke. — **Hickman, Williams & Co.**, Union Commerce Bldg., Cleveland 14, Ohio.

For More Details Circle No. 509—Page 151

Steel Shelving

Bulletin B-20 describes six styles of open and closed types of plain and ledge shelving as well as companion units such as drawer units, counters, tool inserts, and shelving boxes.—**Penco Metal Products Div., Alan Wood Steel Co.**, 200 Brower Ave., Oaks, Pa.

For More Details Circle No. 510—Page 151

Compressed Air Units

Aftercooler-separator filter units for providing clean, cool, dry compressed air are described in bulletin, which is accompanied by separate bulletins giving additional data on three components of the units—aftercoolers, separators, and traps.—**Jas. A. Murphy & Co.**, 1421 East High St., Hamilton, Ohio.

For More Details Circle No. 511—Page 151

Single Line Buckets

Advantages of single line hook-on buckets are shown in a Form HD-1. Information is given on selection of the correct type and size of bucket, how it operates, reeving arrangements, trip mechanism, applications, specifications, and special applications.—**Erie Strayer Co.**, Geist Road and Nickel Plate R.R., Erie, Pa.

For More Details Circle No. 512—Page 151

Powder-Lancing

Typical powder-lancing applications demonstrating time saving in furnace maintenance work and demolition of concrete are described in eight-page booklet.—**Linde Co.**, Room 2840, 420 Lexington Ave., New York 17, N. Y.

For More Details Circle No. 513—Page 151

Truck Maintenance

Preventive maintenance chart enforces time and money-saving maintenance practices and offers tips on obtaining maximum operating efficiency from electric fork trucks.—**Lewis-Shepard Products Inc.**, 125 Walnut St., Watertown 72, Mass.

For More Details Circle No. 514—Page 151

Manifolds for Gases

Complete line of manifolds for dispensing compressed gases is described in Catalog 829. Information includes cylinder capacity, arrangements and dimensions and details on advantages of manifolding. — **Air Reduction Sales Co.**, 150 East 42nd St., New York 17, N. Y.

For More Details Circle No. 515—Page 151

Trolley Conveyors

Specifications and descriptions of components are included in catalog covering overhead trolley conveying systems. It also describes the Trol-e-veyor, a new type of light and medium-duty overhead trolley conveyor. — **Alvey-Ferguson Co.**, 2629 Disney St., Cincinnati 9, Ohio.

For More Details Circle No. 516—Page 151

Laboratory Equipment

Over 250 items, including laboratory shakers, rotators, air pumps, cathetometers, electro analysis apparatus, and stirrers featuring the hollow spindle are described and illustrated in Catalog 57G.—**Eberbach Corp.**, Box 63, Ann Arbor, Mich.

For More Details Circle No. 517—Page 151

Heating and Ventilating

Bulletin 701 describes the complete line of Herman Nelson heating, ventilating and air conditioning products.—Dept. PD, **American Air Filter Co.**, 215 Central Ave., Louisville 8, Ky.

For More Details Circle No. 518—Page 151

Metal Cutting Equipment

Step-by-step method of reducing cleaning room costs with carbon arc —compressed air cutting equipment in a large steel foundry is shown in Bulletin DM-72.—**Hobart Brothers Co.**, Troy, Ohio.

For More Details Circle No. 519—Page 151

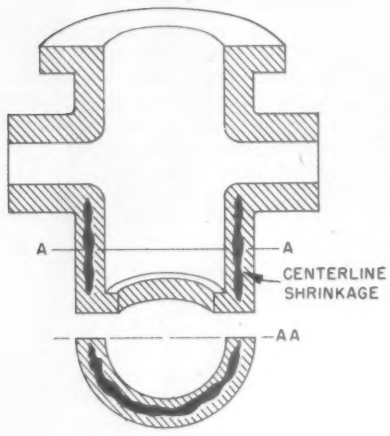
Solid Film Lubricants

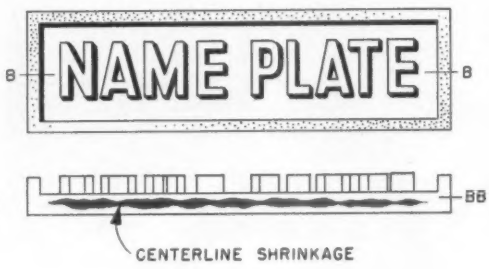
Eight different solid film lubricants and their applications are described in Catalog LB-6-1157. Materials are formulated for conditions of high temperature, low temperature, corrosion resistance, high loads, and high speeds.—**Electrofilm Inc.**, Box 106, North Hollywood, Calif.

For More Details Circle No. 520—Page 151

Trouble Shooting

By C. W. AMMEN





Areas shown in color contain shrinkage. In nameplate, it does not affect service, but it must be eliminated from the brass valve shown at the left

Centerline Shrinkage

Dear Charlie:

We make a brass valve which must be pressure-tight up to 200 psi. Lately, we have been having no end of leakers, but the trouble does not seem to be gas or shrinkage porosity. Cutting up a leaker, we came across something new to us. In one wall was a cavity or separation between the inside and outside which we have been told is centerline shrinkage, a defect I would associate with steel. I once worked in a shop where I could eat all the leakers produced. It used what was called a stabilizer alloy, which was plunged to the bottom of each heat prior to pouring any pressure work. It was not phosphor copper, but was a hard, white metal. All of our valves are made of 85-5-5-5.

Sincerely,
Sam

Dear Sam:

The section sent to me for examination certainly shows centerline shrinkage or cleavage. Although this might seem strange, it is more common than you may think.

In fact, in comparatively thin plaques, nameplates, etc., it occurs often. Because it isn't outwardly visible and because of the service of such parts, it doesn't matter in those castings. In thin swing spouts and bodies for plumbing ware, this defect also is common. The metal is poured very hot through small runners and paper-thin gates which freeze off almost as soon as the cavities are full, affording no feed metal. The outside surface of the casting against the cool sand chills or starts to solidify, and as the crystals start to grow from both sides of the casting, they draw from the liquid metal in the center. As the crystals try to interlock at the centerline, they fail to make a junction because there is no molten metal to fill the interstices. Sound gating and risering can provide feed metal and move the shrinkage due to lack of feed back into the gating and risering system. The end use to which a casting is put is, however, the deciding factor about the seriousness of this condition. Swing fixtures, plaques, and the like are as useful and fulfill their end use equally well with or without centerline shrinkage. To prevent this shrinkage in some cases would entail extensive risering and gating.

The only real answer to this or to any other type of shrinkage is to achieve a true directional solidification toward and winding up in the heads which provide liquid feed metal.

Although this defect is undesirable in your valve body and must be eliminated, it does not necessarily cause loss of pressure tightness. I once saw a bronze cylinder which was machined inside and out. It held 2000 psi easily, but when x-rayed it was found to be hollow from one end to the other.

The golden red color of the cleavage defect in the section you sent would indicate that you are pouring considerably above the correct temperature, thus destroying the advantage of directional solidification. Should this temperature be necessary in order to run the casting, your gating is haywire. Leakers are caused by many things, each of which you must check out carefully:

1. Improper gating and risering.
2. Wet ladle or pouring device.
3. Gassed metal due to improper melting practice.
4. Excessive pouring temperatures.
5. Soaking the melt.
6. The presence of silicon in a

"What is a sound way for
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today?"

"Through a
Knight Engineered audit
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Knight services include:

Foundry Engineering
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Materials Handling
Automation
Survey of Facilities
Marketing

Through experience gained from impartial, objective analysis of hundreds of foundries in this country, Canada, Europe, and South America, Knight Engineers are qualified to determine whether full utilization is being made of facilities and manpower—the balance between profit and loss today.

The Knight organization can help you decide quickly on the most modern equipment and techniques that are economically justified, and to determine what must be done to insure full utilization of man hours and machine capacities.

Knight Engineers have carried out such programs for grey iron, steel, malleable, brass and bronze, magnesium and aluminum castings from a few ounces to 100 tons in weight.

Call or write the Knight organization without obligation to see whether your operation can benefit from this comprehensive experience.

EVIDENCE OF EXPERIENCE

Lester B. Knight & Associates, Inc.

Management, Industrial and Plant Engineers

Member of the Association of Consulting Management Engineers, Inc.
549 W. Randolph St., Chicago 6, Ill.
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New York Office—Lester B. Knight & Associates, 375 Fifth Ave., New York City 16
Knight Engineering Establishment (Vaduz), Zurich Branch, Bahnhofstrasse 17, Zurich, Switzerland

Circle 657 on Page 117

a complete line of
ROLLER CONVEYERS

engineered and standardized by

MATHEWS

Roller conveyer pouring lines served by two roller conveyer transfer cars in modern mechanized foundry.

The Mathews line of roller conveyer is complete, with rollers ranging from 1-¾" to 6-½" in diameter, and with capacities from 60 lbs. to 13,000 lbs. High quality ball bearings are used throughout.

Accessories such as turntables, hinges and switches are available from stock.

A full line of couplings and supports makes the installation of Mathews Roller Conveyer lines convenient and easy.

For latest information write for
CATALOG 156

MATHEWS CONVEYER COMPANY
GENERAL OFFICES . . . . . ELLWOOD CITY, PENNSYLVANIA
PACIFIC COAST DIV. . . . MATHEWS CONVEYER COMPANY WEST COAST, SAN CARLOS, CALIFORNIA
CANADIAN DIVISION . MATHEWS CONVEYER COMPANY, LTD., PORT HOPE, ONTARIO.

MATHEWS
(Member Foundry Equipment Manufacturers Association)

heat containing lead—as little as 0.05 per cent can alter the fracture completely. Aluminum also is an offender.

7. Cores with too high a hot strength, which causes hot tearing, etc.

Although 85-5-5-5 is used widely for small and medium pressure-tight castings, a leaded tin bronze (75 Cu, 7 Sn, 15 Pb, and 3 Zn, approximately) not only offers much better castability, but in my opinion is unexcelled for production of free-machining, pressure-tight castings which will not exceed 525° F in service. I have seen this alloy do the job when gun metal, 85-5-5-5, etc., failed. Many thousands of small steam valves, stuffing boxes, etc., giving good service at 500° F and 400 to 600 psi, are made of 75-7-15-3. Try this alloy as an alternate for your 85-5-5-5. I am sure you will find it superior for the use you have in mind.

The term "stabilizer alloy" is a broad one applied to additions made for various purposes. Some are used to make additions only, some are used to make additions and deoxidize, and some are used only to deoxidize. All can be called stabilizer alloys.

Sincerely,
Charlie

MFS Names Winners of Its 1957 Safety Contest

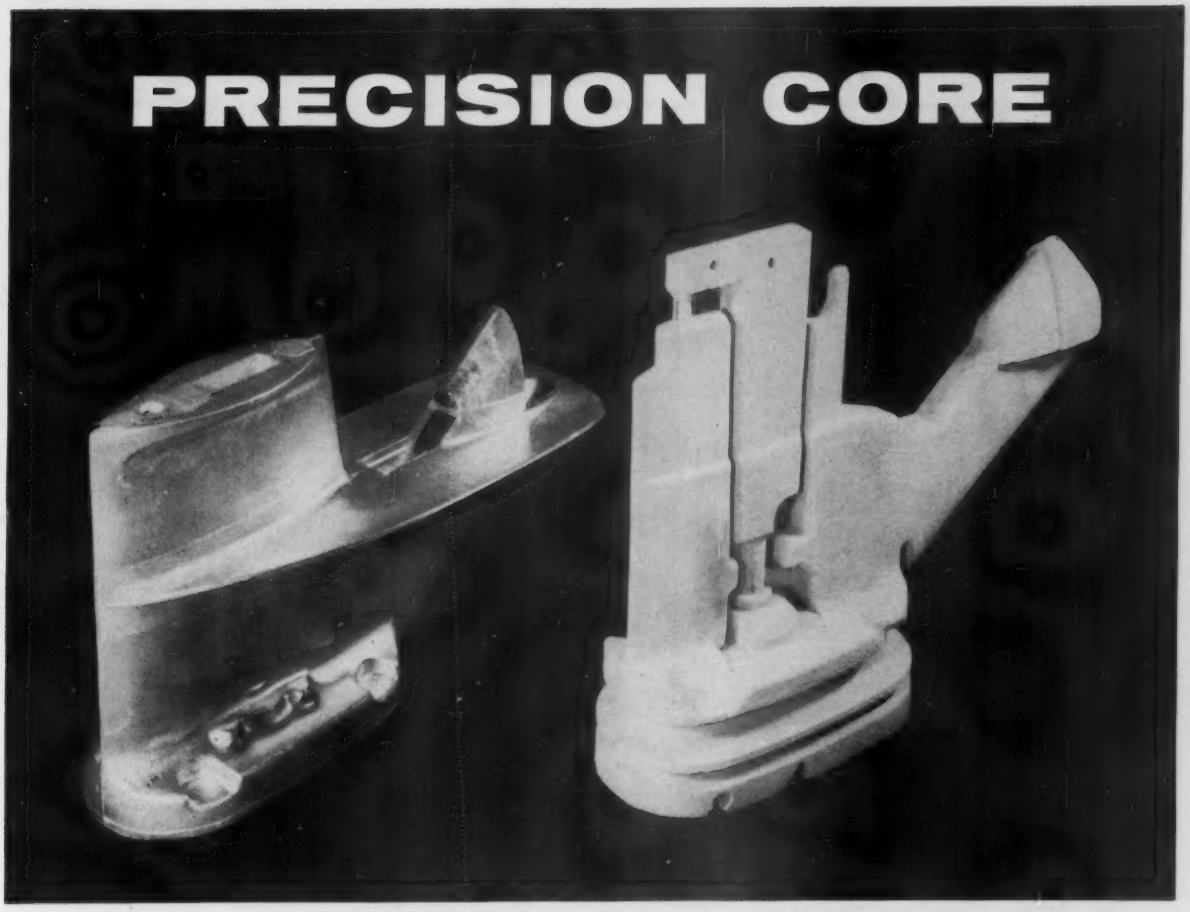
Malleable Founders' Society has announced the 1957 winners of its yearly Safety Self-Improvement Contest. They are New Haven Malleable Iron Company, New Haven, Conn.; Superior Steel & Malleable Castings Co., Benton Harbor, Mich.; Wilmington Malleable Iron Works of the Eastern Malleable Iron Co., Wilmington, Del.; and Texas Foundries Inc., Lufkin, Texas. Awards are made by classes according to the number of employees.

New Haven Malleable Iron Co. and Wilmington Malleable Iron Works will also receive special commendations for going through 1957 without a lost-time accident. These commendations are newly designed posters congratulating the plant employees for the fine job they have done in achieving the perfect record.

Since the contest's inception in 1951, the lost-time accident frequency rate for all member plants in the society has been reduced 36 per cent.

Circle 639 on Page 117

PRECISION CORE



Casting and core for upper gear housing of outboard motor.

made with CO_2 in 15 seconds

This intricate *one piece* core was made in 15 seconds with CO_2 — a feat virtually impossible by any other method. That's another example of what CO_2 can do for you!

The CO_2 process insures accuracy and dimensional stability. At the same time, it saves money by reducing labor costs and by eliminating the risks involved in baking and handling.

Write for our free report on other applications of the CO_2 process. Our engineering staff is always ready to work with you.

World's Largest Producer of CO_2

LIQUID CARBONIC

DIVISION OF GENERAL DYNAMICS CORPORATION

Chicago 23, Illinois

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3150 South Kedzie Ave., Chicago 23, Illinois

Please send me a full report on core and mold making with CO_2.

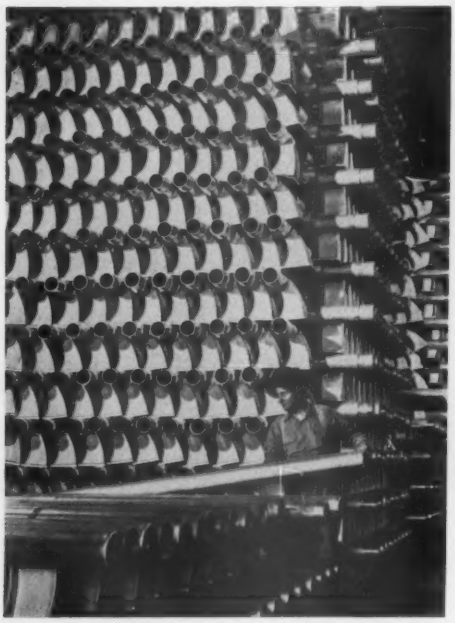
Name_____ Title_____

Company_____

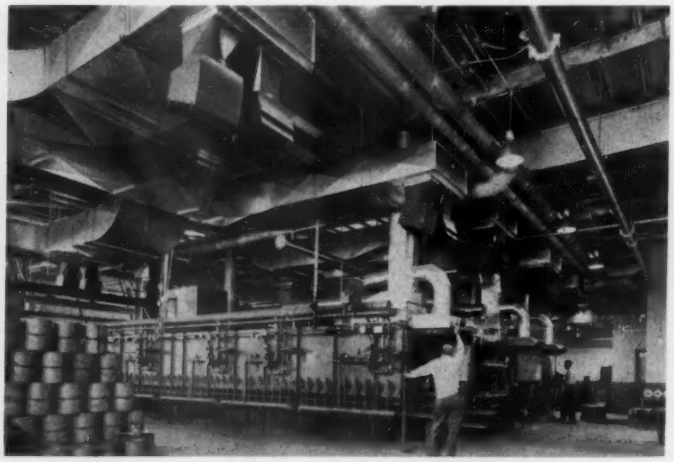
Address_____

City_____ Zone_____ State_____

News Views

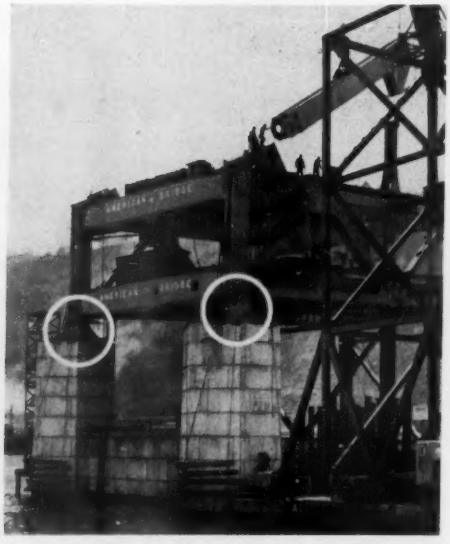


CAST ALUMINUM POSTS: Nearly 10 miles of aluminum bridge posts are being installed on San Francisco's Embarcadero Freeway and Central Viaduct. The railing is being fabricated from 5-in. 6063-T6 aluminum alloy tubing extruded by Kaiser Aluminum & Chemical Corp. Two men can install them without any special lifting equipment, and no painting is needed



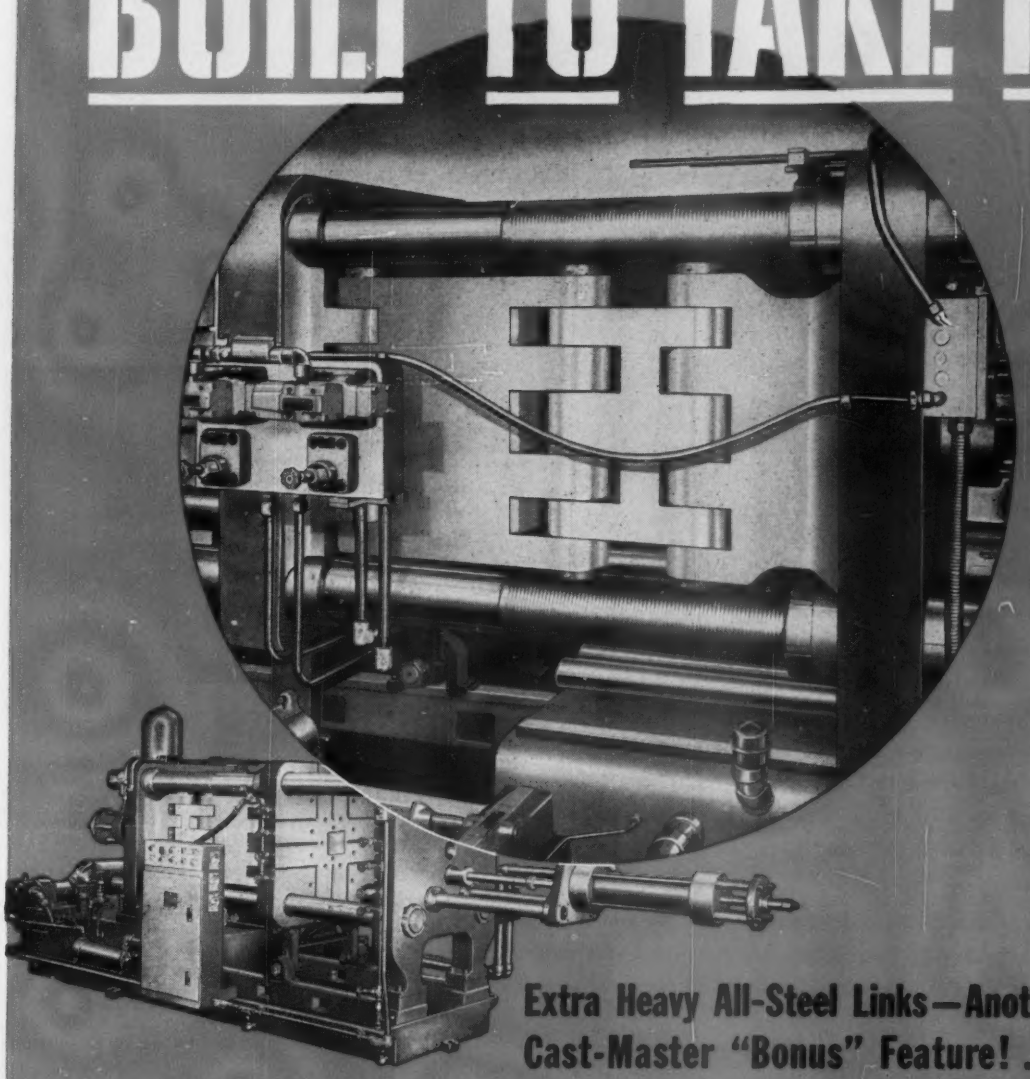
FOUNDRY VENTILATION: This ventilation system was designed and installed for the new Austenal Inc. plant at LaPorte, Ind., by Wigton-Abbott Corp., Plainfield, N. J. It produces a complete change of air in the furnace area every 30 seconds and is constructed so that perspiring workers are protected from drafts. Temperatures can vary no more than 1 degree from the predetermined level

REFRACTORIES PLANT: The fifth basic refractories plant it has built in the last decade has been completed at Hammond, Ind., by Harbison-Walker Refractories Co., Pittsburgh. H-W also has built a new rotary kiln plant at Ludington, Mich., which supplies magnesite to the Hammond facility. View above shows a power press in operation



BRIDGE SUPPORTS: Two 52,000-lb steel castings support the superstructure of the Fort Pitt Bridge across the Monongahela River at Pittsburgh. They were cast at the Coraopolis, Pa., foundry of Blaw-Knox Co.'s Foundry & Mill Machinery Div. White circles indicate the positions of the two castings

BUILT TO TAKE IT



Extra Heavy All-Steel Links—Another Cast-Master "Bonus" Feature! . . .

The story of Cast-Master quality is a story of "bonus" features — like the link system shown here. Cast-Master links are super-rugged — all-steel — machined — with wide spread for positive lock-up, and multiple shear points to eliminate link pin breakage. Result? — more precision — lower maintenance costs for Cast-Master owners. To get the complete "bonus" story, send for the new Cast-Master catalog.

Eastern Rep. Milton Harmon, 18 Rock Rd., Milford, Connecticut
Midwest Rep. C. W. Stone Co., Minneapolis, Minnesota
Western Rep. Sydney J. Wills, 2120 Strand, Hermosa Beach, Calif.
Central-West Rep. Earl L. Johnson, 1696 Webster Lane, Des Plaines, Illinois

CAST-MASTER *Inc.* 23901 AURORA ROAD
BEDFORD, OHIO

Circle 641 on Page 117

MECHANIZATION PAYS...
under any business conditions*

Large poured mold, made at one of the cope and drag stations, being dumped by an automatic mold dumper into a vibrating conveyor below. From here the mold pallet cars and bottom boards are automatically returned to molder on an underneath run of track. One man using this system can handle the shakeout of from 10 to 15 lines.

*Newaygo engineers can plan mechanization for your foundry as an investment you can afford to meet. They can prove how successful mechanization pays for itself by placing foundries in a better competitive position.

Featured above is just one type of a completely mechanized Sand Handling System which was designed, manufactured and installed by Newaygo. The view from the pouring floor of this large operating foundry shows nineteen overhead molders' hoppers. Four serve two cope and drag floors with fifteen serving individual squeezer molders. Hoppers are specially designed of Stain-clad Steel with air operated gates. Also shown is the mold storage end of the pallet car set-out track system.

Systems of this type are designed at one time and can be installed complete or broken up into components for progressive mechanization. Designs are made to serve existing as well as projected new foundries.

PROOF OF SAVINGS is evidenced by these leading foundries using Newaygo Pallet Type System of mold handling and automatic shakeout.

West Michigan Steel Foundry Co.
Fort Pitt Steel Casting Co.
Auburn Foundry, Inc.
Mid-West Foundry Co.
Atlas Foundry Co.
Peru Foundry Co.
Acme Steel and Malleable Iron Co.
State Foundry Co.
Neptune Meters Ltd.
Acinfer, S.A.

"Foundry Business is BIG Business"

NEWAYGO engineering company
NEWAYGO, MICHIGAN

. . and profitable too, with NEWAY® MOLD HANDLING, SAND HANDLING AND CONDITIONING EQUIPMENT

Foundry Statistics

ALUMINUM

(Shipments of castings—1000 pounds[1])

	Shipments				Unfilled Orders[2]
	Total	Sand	Perm. Mold	Die	
1956	794,581	171,181	245,421	376,230	.....
1957					
Feb.	69,451	13,366	21,707	34,311	107,869
2 mo.	142,450	27,567	42,670	71,505	.....
Mar.	74,527	13,914	22,974	37,521	107,963
Apr.	68,284	14,287	20,376	33,493	98,113
May	65,108	12,705	20,708	31,602	94,748
June	58,547	11,585	17,180	29,700	88,086
July	52,173	10,447	16,322	25,339	89,430
Aug.	55,735	10,996	18,398	26,319	89,826
Sept.	58,692	11,367	17,820	24,900	93,720
Oct.	64,140	11,570	20,543	31,936	91,817
Nov.	58,898	10,411	18,611	29,793	91,860
Dec.	53,102	9,302	16,724	26,978	86,323
Total	751,656	144,151	232,326	369,086	.....
1958					
Jan.	57,845	10,724	18,082	28,937	77,067
Feb.	50,695	9,601	15,456	25,279	75,647
2 mo.	108,540	20,325	33,538	54,216	.....

MALLEABLE IRON

(Shipments of castings—net tons[1])

	Shipments						Unfilled Orders[2]
	Total	For Sale	Standard Total	Standard For Sale	Pearlitic Total	Pearlitic For Sale	
1956	951,868	557,636	812,905	466,845	138,963	78,073	.....
1957							
Feb.	78,028	46,729	65,411	39,590	12,617	7,139	90,725
2 mo.	164,005	98,237	137,100	82,991	26,905	15,246	.....
Mar.	78,013	48,311	64,560	40,645	13,453	7,666	89,431
Apr.	80,271	51,320	65,990	42,810	14,281	8,510	83,116
May	76,504	46,277	63,058	38,072	13,446	8,205	79,787
June	72,556	44,639	59,829	36,892	12,727	7,747	76,331
July	57,748	34,876	45,100	27,290	12,648	7,586	80,694
Aug.	65,426	39,644	55,320	33,781	10,106	5,863	84,876
Sept.	62,457	38,397	52,281	31,658	10,176	6,739	83,385
Oct.	77,667	45,989	66,043	39,269	11,624	6,720	82,995
Nov.	67,904	38,085	55,564	31,036	12,340	7,049	80,074
Dec.	60,425	34,343	48,694	27,218	11,731	7,125	74,863
Total	862,976	520,118	713,539	431,662	149,437	88,456	.....
1958							
Jan.	62,734	34,920	51,440	28,516	11,294	6,404	67,292
Feb.	54,650	31,006	45,419	25,381	9,231	5,625	59,047
2 mo.	117,374	65,926	96,859	53,897	20,525	12,029	.....

COPPER-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments			Unfilled Orders[2]
	Total	Sand	Perm. Mold	
1956	866,306	866,545	57,522	.....
1957				
Feb.	72,084	64,346	4,188	54,133
2 mo.	154,109	137,548	8,698	.....
Mar.	77,418	69,258	4,445	49,135
Apr.	77,167	69,141	4,316	48,148
May	75,347	67,251	4,421	46,791
June	70,959	63,910	3,590	44,232
July	60,621	54,847	3,010	44,175
Aug.	71,233	64,953	3,278	40,446
Sept.	70,804	64,470	3,243	40,298
Oct.	81,836	74,391	3,693	39,063
Nov.	70,187	63,944	3,006	34,249
Dec.	65,708	59,606	3,046	31,509
Total	875,389	788,319	44,696	.....
1958				
Jan.	69,707	63,294	3,327	30,341
Feb.	58,356	52,579	3,202	27,243
2 mo.	128,063	115,873	6,529	.....

MAGNESIUM

(Shipments of castings—1000 pounds[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1956	36,168	33,580	....
1957			
Feb.	2,661	2,473	8,276
2 mo.	5,868	5,490	....
Mar.	2,970	2,804	7,690
Apr.	2,896	2,723	7,542
May	2,832	2,706	7,188
June	2,973	2,817	6,765
July	2,544	2,384	6,964
Aug.	2,315	2,150	6,222
Sept.	2,279	2,071	5,705
Oct.	2,192	2,093	5,318
Nov.	1,920	1,806	4,802
Dec.	1,533	1,408	4,823
Total	30,322	28,452	....
1958			
Jan.	1,881	1,756	5,227
Feb.	1,803	1,730	5,589
2 mo.	3,684	3,486	....

PRODUCTION WORKERS

Estimated Number	Feb. 1958	Jan. 1958	Feb. 1957
Ferrous	172,600	181,600	208,300
Nonferrous	52,200	54,800	68,300
Average Weekly Earnings			
Gray Iron	78.94	78.72	84.07
Malleable Iron	84.00	81.09	85.39
Steel	90.38	91.20	96.28
Nonferrous	89.24	90.25	91.35
Average Weekly Hours			
Gray Iron	35.4	35.3	39.1
Malleable Iron	37.5	36.2	39.9
Steel	37.5	38.0	41.5
Nonferrous	38.3	38.9	40.6

Source: Bureau of Labor Statistics.

GRAY IRON CASTINGS—SHIPMENTS

(Net tons[1])

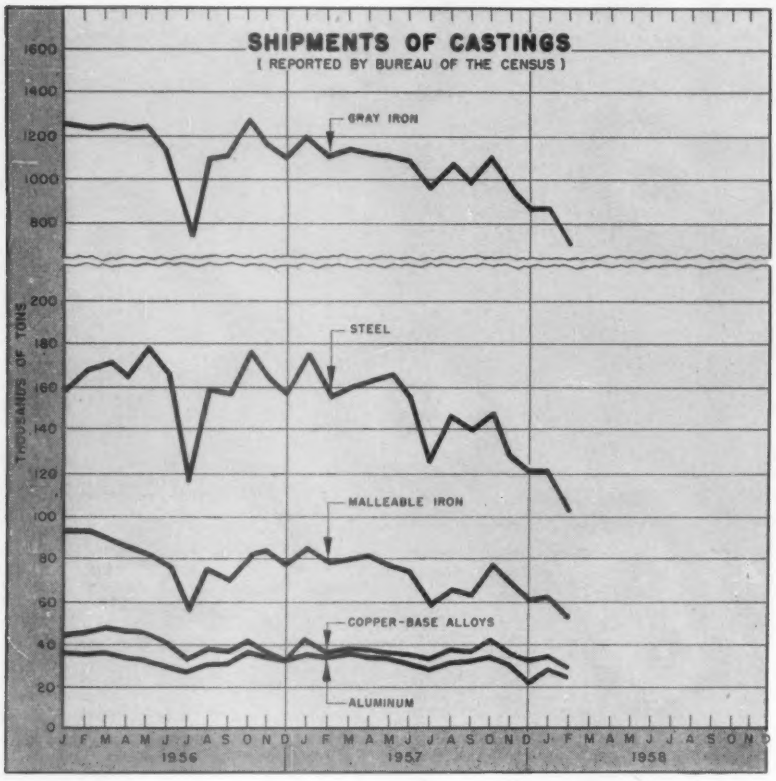
	All Castings		Miscellaneous Castings		Nodular Iron Castings	Heavy Steel Ingot Molds	Chilled Railroad Car Wheels	Pressure Pipe & Fittings	Soil Pipe & Fittings	Unfilled Orders[2]
	Total	For Sale	Total	For Sale	Total	Total	Total	Total[3]	Total[3]	
1956	13,860,527	7,963,135	8,265,526	3,650,735	.....	2,624,146	406,191	1,746,902	817,762	.....
1957										
Feb.	1,103,118	582,010	705,585	302,514	.....	230,126	30,079	89,146	48,182	931,054
2 mo.	2,316,333	1,224,327	1,467,282	622,572	.....	492,087	61,218	190,215	105,528	.....
Mar.	1,133,146	604,481	713,767	305,104	.....	214,775	36,995	108,158	59,451	934,847
Apr.	1,120,349	611,443	699,395	288,319	10,235	192,199	36,979	128,710	63,066	899,074
May	1,112,096	625,496	674,460	291,557	11,206	192,336	34,406	141,685	69,209	879,825
June	1,058,464	599,494	630,513	274,115	10,207	193,640	32,087	131,360	70,864	853,012
July	954,102	523,489	565,897	243,187	10,901	190,434	31,209	106,532	60,030	825,676
Aug.	1,075,957	596,779	630,130	265,185	10,339	205,655	28,976	138,209	72,987	825,676
Sept.	990,139	563,477	579,444	259,649	10,253	202,914	23,681	119,689	64,411	805,301
Oct.	1,099,554	601,109	668,895	282,024	11,974	210,521	26,306	122,149	71,683	740,169
Nov.	940,138	482,732	599,292	242,847	10,601	166,652	24,302	91,138	58,754	704,623
Dec.	864,226	443,670	557,154	226,356	9,810	148,074	23,173	73,500	62,325	675,838
Total	12,664,504	6,876,497	7,786,229	3,310,915	.....	2,409,290	359,332	1,351,345	758,308	.....
1958										
Jan.	868,255	436,398	580,545	229,014	10,800	135,110	23,511	78,863	50,226	638,069
Feb.	753,306	389,708	503,175	203,717	10,245	116,168	25,959	67,606	40,398	632,490
2 mo.	1,621,561	826,106	1,083,720	432,731	21,045	251,278	49,470	146,469	90,624	.....

STEEL CASTINGS—SHIPMENTS

(Net tons[1])

	All Castings			Carbon			Alloy			Unfilled Orders[2]
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	
1956	1,931,987	1,512,290	368,918	1,444,768	1,122,109	345,091	487,219	390,181	23,827	.....
1957										
Feb.	154,932	121,667	27,181	114,805	89,480	25,060	40,127	32,187	2,121	511,806
2 mo.	324,172	255,493	57,271	240,194	188,013	52,799	83,978	67,480	4,472	.....
Mar.	160,054	124,416	29,968	121,089	93,466	27,683	38,965	30,950	2,285	503,407
Apr.	162,498	124,549	29,708	122,894	93,512	27,624	39,604	31,037	2,084	497,632
May	164,575	125,431	32,840	124,840	94,635	30,926	39,735	30,796	1,914	504,990
June	153,647	119,353	31,338	116,759	91,009	28,766	36,888	28,344	2,572	494,267
July	122,018	90,037	22,803	91,730	67,719	21,426	30,288	22,318	1,377	489,390
Aug.	145,926	111,080	33,641	113,167	86,407	31,639	32,759	24,673	2,002	471,190
Sept.	139,002	105,611	29,718	106,261	80,871	27,885	32,741	24,740	1,863	438,510
Oct.	146,397	113,216	31,477	110,100	85,144	29,320	36,297	28,072	2,157	395,907
Nov.	127,115	98,436	26,892	93,343	71,846	25,105	33,772	26,590	1,787	362,948
Dec.	120,787	92,125	23,403	88,101	66,468	21,808	32,686	25,657	1,595	327,337
Total	1,766,191	1,359,747	349,059	1,328,478	1,019,090	324,951	437,713	340,657	24,108	.....
1958										
Jan.	120,722	94,717	22,545	87,525	68,203	21,115	33,197	26,514	1,430	304,907
Feb.	103,297	79,708	16,647	74,283	56,781	15,273	29,014	22,927	1,374	282,358
2 mo.	224,019	174,425	39,192	161,808	124,984	36,388	62,211	49,441	2,804	.....

[1]Source: Bureau of Census. [2]For sale only. [3]All cast iron pipe is shipped for sale.



COKE PRODUCTION AND CONSUMPTION

(Net tons*)

	Production	Consumption Total	Consumption By Foundries
1956	74,454,264	73,814,941	2,856,395
1957			
Feb.	6,213,577	6,304,315	229,749
2 mo.	13,073,234	13,402,356	471,227
Mar.	6,895,077	6,804,267	233,176
Apr.	6,436,259	6,396,886	227,609
May	6,631,807	6,521,105	220,063
June	6,361,611	6,317,615	188,877
July	6,501,595	6,375,616	180,698
Aug.	6,519,973	6,401,949	206,907
Sept.	6,296,519	6,186,475	199,226
Oct.	6,275,567	6,120,485	208,720
Nov.	5,615,746	5,425,296	199,052
Dec.	5,164,965	5,099,556	173,470
Total	75,772,353	74,961,606	2,509,025
1958			
Jan.	4,762,050	4,643,022	192,098
Feb.	4,079,349	4,031,542	171,511
2 mo.	8,841,399	8,674,564	363,609

INGOT BRASS AND BRONZE

(Shipments in net tons)

	1957	1958
Jan.	25,681	20,468
Feb.	20,769	17,413
Mar.	21,948	18,825
Apr.	23,507	.....
May	22,037	.....
June	18,888	.....
July	16,695	.....
Aug.	19,654	.....
Sept.	19,670	.....
Oct.	22,800	.....
Nov.	19,767	.....
Dec.	16,875	.....
Total for year	248,291	.....

Source: Defense Council of the Ingot Brass and Bronze Industry.

ZINC-BASE ALLOYS

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1956	693,728	449,516	.....
1957			
Feb.	59,793	36,580	74,739
2 mo.	127,757	78,769	.....
Mar.	61,378	40,593	64,466
Apr.	54,982	34,801	59,534
May	53,565	35,676	66,712
June	49,356	33,206	64,137
July	48,379	29,418	64,043
Aug.	49,829	34,040	64,789
Sept.	47,736	33,838	68,122
Oct.	62,332	39,990	69,275
Nov.	58,689	35,005	63,665
Dec.	49,597	29,998	58,792
Total	663,600	425,334	.....
1958			
Jan.	50,568	30,368	55,883
Feb.	42,687	27,482	50,676
2 mo.	93,255	57,850	.....

INDEX OF FOUNDRY EQUIPMENT ORDERS

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1957	1958
Jan.	117.9	57.9
Feb.	188.4	57.6
Mar.	127.0	....
Apr.	101.1	....
May	136.2	....
June	187.5	....
July	98.6	....
Aug.	231.3	....
Sept.	113.9	....
Oct.	145.3	....
Nov.	59.6	....
Dec.	61.4	....

Note: Figures are percentages of the base period 1947-49 taken as 100 per cent monthly average.

Source: Foundry Equipment Manufacturers Association.

IRON AND STEEL SCRAP CONSUMPTION

(Gross tons*)

	All Scrap Total	By Types of Furnace—Cupola Total	By Types of Furnace—Air Total	By Types of Furnace—Electric Total
1955	72,654,925	10,786,957	1,273,470	8,757,593
1956				
Dec.	6,264,955	722,320	82,160	851,770
Total	71,709,489	9,817,287	1,133,128	9,862,887
1957				
Jan.	6,630,804	874,764	102,782	927,499
Feb.	6,038,436	804,185	93,902	834,843
Mar.	6,294,038	814,372	92,534	903,149
Apr.	5,816,309	835,027	97,289	807,922
May	5,753,435	812,141	92,260	786,210
June	5,430,607	744,790	80,063	705,590
July	4,897,752	652,773	68,504	629,395
Aug.	5,299,543	765,877	81,941	759,517
Sept.	5,033,998	721,125	82,948	672,597
Oct.	5,333,767	817,338	91,766	718,791
Nov.	4,858,489	716,095	72,871	589,879
Dec.	4,281,414	661,918	70,091	542,008
Total	65,688,592	9,220,405	1,026,951	8,876,400

PIG IRON PRODUCTION AND CONSUMPTION

	Production** (Standard grades—net tons) Total	Foundry	Malleable & Silvery	Basic	Low Phos. Intermediate Low Phos. & Bessemer	Consumption* (By type of furnace—gross tons) Total	Cupola	Air	Electric
1956	75,301,134	2,402,861	3,733,258	61,900,276	7,264,761	60,571,150	4,419,655	242,144	190,386
1957									
Mar.	7,179,100	168,650	347,451	6,008,135	654,864	6,155,334	370,915	20,241	23,259
3 mo.	20,984,780	458,801	986,015	17,504,004	7,034,357	18,497,905	1,163,781	63,973	63,133
Apr.	6,810,102	162,023	329,180	5,686,507	632,392	5,586,587	369,359	20,495	19,756
May	6,877,052	258,638	313,583	5,720,212	584,619	5,862,966	362,085	19,201	17,869
June	6,593,326	243,789	318,906	5,436,203	594,428	5,672,086	335,574	17,044	17,744
July	6,625,901	221,929	336,590	5,515,736	551,646	5,558,702	306,119	14,735	17,992
Aug.	6,719,763	228,378	298,269	5,451,691	741,425	5,769,995	349,988	17,540	25,948
Sept.	6,569,074	218,297	292,244	5,272,056	786,477	5,645,036	321,728	17,084	28,638
Oct.	6,454,450	164,944	303,104	5,390,851	595,551	5,669,624	354,364	18,466	24,691
Nov.	5,711,242	153,722	290,547	4,759,255	507,718	5,073,898	309,674	14,886	17,199
Dec.	5,212,624	165,268	228,897	4,394,869	423,590	4,565,635	288,219	14,754	13,881
Total	78,557,011	2,275,789	3,697,335	65,131,684	7,452,203	67,902,434	4,160,891	218,178	246,851
1958									
Jan.	4,785,269	100,097	232,862	4,036,451	415,859	.....	.....	.....	.....
Feb.	4,016,276	106,921	193,429	3,396,382	319,094	.....	.....	.....	.....
Mar.	4,418,778	156,386	227,785	3,645,353	389,254	.....	.....	.....	.....
3 mo.	13,220,242	363,404	620,374	11,112,257	1,124,207	.....	.....	.....	.....

*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only.

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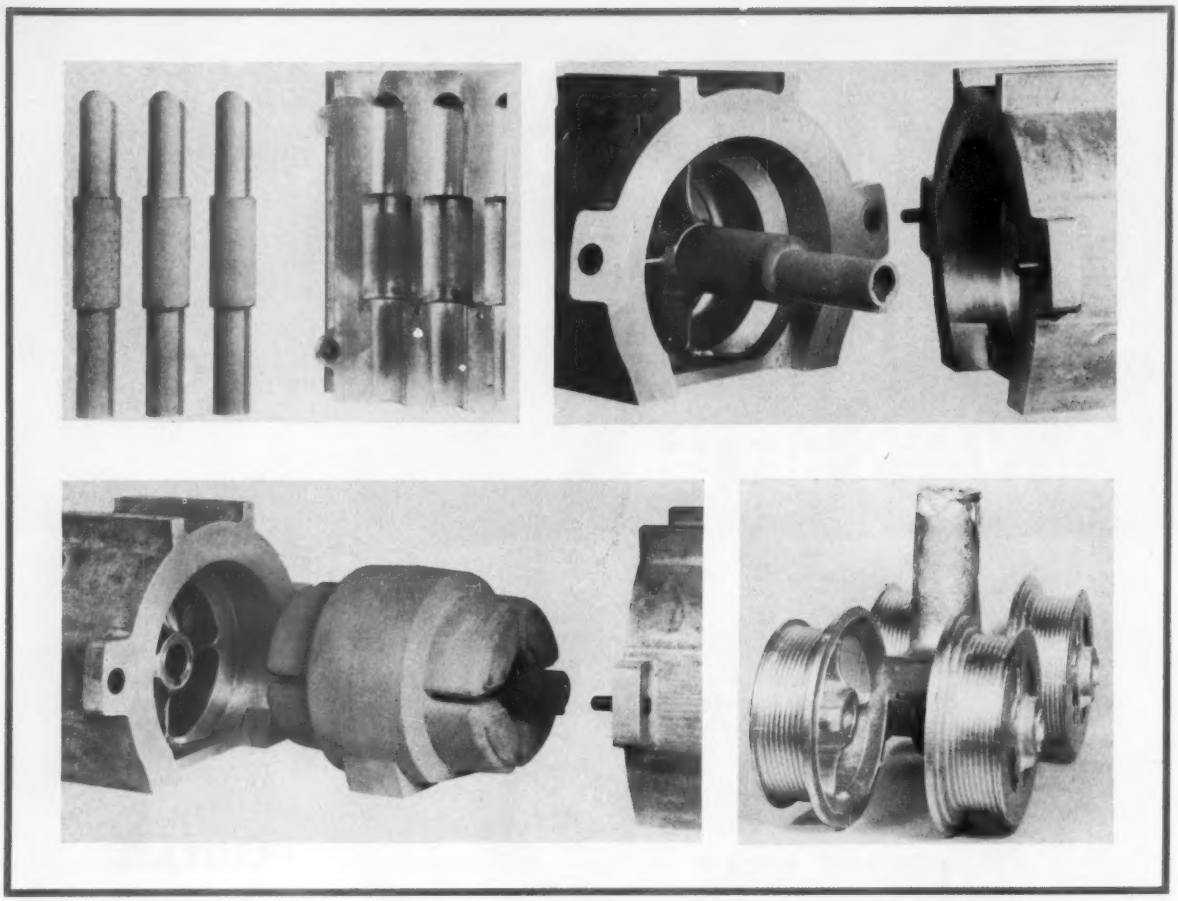

Left to right, steps in production of aluminum castings made in shell mold with shell cores and used as cast: Center bore and keyway cores (no draft); Center core ready for investment in final shell core; core assembly; the two castings

Shell Cores for Problem Jobs

By R. M. RONNE
Dependable Works
Portland, Oreg.

DIFFICULT core problems, an old headache to foundrymen, are being challenged successfully by the relatively new shell method of coremaking. Shell cores can provide foundryman, patternmaker, and designer with the high degree of accuracy, permeability, collapsibility, and easy shakeout they desire. These cores may not be the answer to all foundry ills, but they are one of the greatest improvements since blowing of oil-sand cores was developed.

Because of the close tolerances and fine surface finish that can be achieved by this method, machining almost always is reduced substantially. In many instances, it is eliminated entirely. As a result of being cured in the box, cores are exceptionally uniform. This uniformity is reflected in castings, and jigging and chucking devices can be used to the greatest possible advantage.

Machining Reduced — Many items that formerly had to be bored and threaded now are produced with the threads cast in, thereby reducing over-all cost considerably. Small steel parts that required a roughing cut and a finish cut can be made by allowing as little as 0.020 in. on a side for finishing, thus reducing the time in the machine shop. Internal cavities and intricate shapes can be held to such tolerances as to make some machining unnecessary. Fine surface finish, free from "burn-in" or fins at pasted joints or at cracks, is achieved by this method.

Excellent collapsibility has just about eliminated the hot tearing often experienced in thin aluminum and steel castings. The hollow cores break down early enough to prevent strains and tearing.

Although this method seems to lend itself mostly to small and complex shapes, it also is being used in rather large jobs, especially when uniformity and accuracy are im-

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HEAVY DUTY JOLT SQUEEZER
WITH
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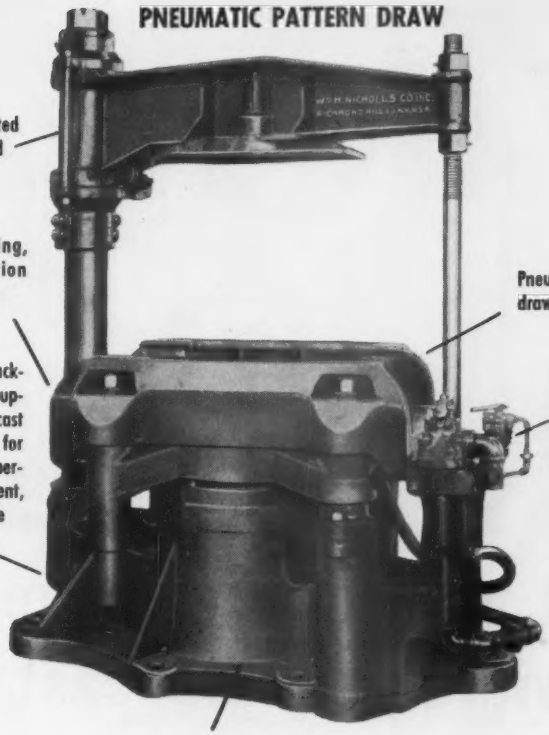

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Simple controls, push button or manual operation, automatic jolt and squeeze timing mean greater safety, shorter "break in" time, less manhours

Heavily ribbed for added strength

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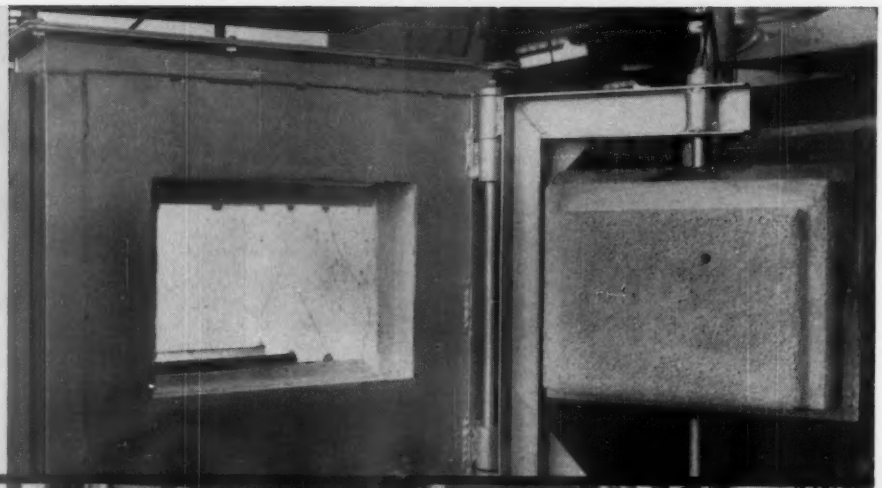

LINED WITH ALUNDUM 33-I CASTABLE, this furnace has been used for almost a year as a periodic furnace for high-temperature laboratory test work. During this time the door was opened and closed over a thousand times with the furnace at temperature. Even after this rugged service, the ALUNDUM Castable lining shows hardly any signs of wear.

LINED WITH A COMPETITIVE HIGH GRADE INSULATING BRICK, this similar furnace was used in the same service for an equal length of time. Under equally severe thermal shock conditions the lining cracked and spalled and this furnace must be rebuilt.

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Up to 3300° F!

ALUNDUM 33-I Insulating Castable is made up primarily of countless tiny, pure aluminum oxide bubbles. Forming a network of air spaces it provides excellent insulation, even at the highest commercial temperatures.

ALUNDUM 33-HD Heavy Duty Castable is chiefly composed of dense grains of pure aluminum oxide. It is recommended for forming dense monolithic surfaces in constructing many types of furnaces where high temperature conditions are more severe.

Both ALUNDUM 33-I and 33-HD Castables protect at temperatures up to 3300° F and are very easy to mix and use. You can cast simple or complex shapes with them quickly and inexpensively for many installations and replace more expensive pre-fired shapes.

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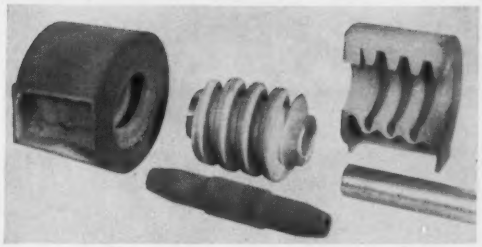
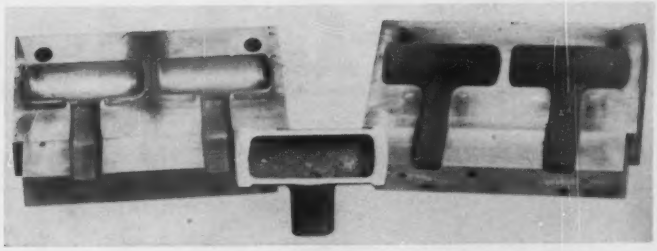


Worm illustrates accuracy of shell cores. It is used as cast, press fitted on the ¾-in. shaft



Hollow shell cores offer good permeability and easy shakeout. Note venting at parting of box

portant factors. In addition, shell cores are used not only in shell molds, but also in green sand and permanent molds.

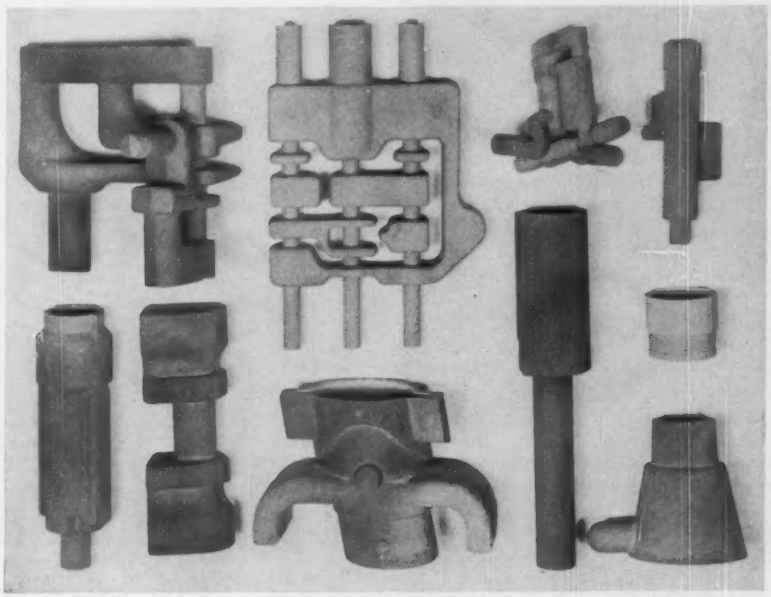
Being hollow and of reasonably thin wall section, shell cores are exceptionally permeable. Gas blows are rare. By the time castings are cool, most of the sand is free running, and shakeout is simple. Also, there are no wires or rods to retrieve.

When cores are so shaped that they cannot be drained before curing, the center of the large mass of core sand is impossible to cure without oven curing and almost always causes a gas blow. Such cores are not actually shell cores and should be avoided.

Must Withstand Heat — Equipment for shell cores is made in much the same manner as that for any other method of coreblowing. Coreboxes must be made of metal to stand heat up to a maximum of about 600° F. They should be nicely machined and finished and free from pinhole porosity and other blemishes. Low-melting point solder and other filler that will not stand the heat cannot be used. When blemishes must be corrected in cast coreboxes, silver solder can be used, or pinholes can be drilled out and peened full of aluminum or copper wire.

Cast iron is especially desirable as corebox material because it is stable and nonporous and has high heat radiation. Cast brass also is a good material. It machines and finishes nicely and has good heat conductivity. Although cheaper to machine and finish than harder metals, it is, however, rather delicate when hot and is not as stable. Low pressures are used to blow shell cores, and coreboxes show very little wear even in long runs.

Coreboxes should be designed to be held in the shell coreblower by clamps provided at the machine, or flanges or bosses should be drilled and tapped for capscrews. Care must be taken when locating or indexing shapes are required on the core. It must be remembered that one end of the core usually is open and is not accurately finished where it rests on the dump-box cover.



The shell process often simplifies the production of problem cores. Intricate detail and complex shapes can be made without pasting or use of driers

Venting Important — Venting is the same in shell coreboxes as in other blow boxes—that is, vents must be provided to draw off trapped air. A vent can be made at the corebox parting by milling down about 0.005 to 0.008 in., then providing an escape to atmosphere by drilling through or milling a slot on the parting face, out to the edge of the corebox.

When venting is required other than at the parting, screened or slotted vents should be installed as in coreboxes for any other type of blown core. Resin-coated or mixed sand blows easily because it is highly flowable. When screened or slotted vents are used, however, it is almost imperative that coated sand be used. The free resin in mixed sand will contaminate the vents on the first blow cycle, thereby causing trouble on subsequent cycles.

When the corebox is new, it must be cleaned thoroughly and treated with a parting agent—usually a silicone substance. It should be sprayed periodically with a diluted silicone after it has been broken in. When the corebox is to be stored, it should be wiped clean and stored in a dust-free, reasonably dry place.

Shell cores come out of the box finished and ready for the mold. Made properly, for a logical application, they have a decided advantage over cores which require pasting or the use of driers.

Several machines are available to make these cores. Some heat the corebox continuously with gas or electricity; others use multiple coreboxes which are heated, invested, drained, and retrieved variously.

Around the Country

NEWS REPORTS FROM

Washington . . . Chicago . . . Pittsburgh . . . Boston

Washington—A conference on steel castings, sponsored by the Corps of Engineers, U. S. Army Corps Engineer Research and Development Laboratories, was held at Fort Belvoir, Va., April 15-17, in co-operation with other government agencies. An interesting program was presented jointly by the Steel Founders' Society of America, the Alloy Casting Institute, and the Investment Casting Institute.

The first session on the "Use and Purchasing of Steel Castings" included the following talks: "Why and When To Use Steel Castings," by Allen M. Slichter, president, Pelton Steel Casting Co., Milwaukee; "Purchasing Steel Castings," Henry J. Kelly, chief engineer, Dodge Steel Co., Philadelphia; "Use of Light Section Steel Castings," John Boyd, general sales manager, Lebanon Steel Foundry, Lebanon, Pa.; "Use of Steel Castings in the Medium Section Range," T. R. Eggert, sales manager, LFM Mfg. Co. Inc., a subsidiary of Rockwell Mfg. Co., Atchison, Kans.; "Steel Castings above 5000 lb," T. F. Dorsey, president, Pittsburgh Steel Foundry Corp., Pittsburgh; and "Future of Steel Castings," R. W. deWeese, vice president, Electric Steel Foundry Co., Portland, Oreg.

Papers at the second session on "Elements of Design for Steel Castings" included: "Factors To Be Considered by the Designing Engineer," by E. J. Warnock, mechanical engineer, Symington-Wayne Corp., Depew, N. Y.; "Engineering + Foundry = Proper Casting Design," Robert Franck, chief engineer, Superior Steel & Malleable Castings Co., Benton Harbor, Mich.

Also, "Photoelastic Studies of Joined Sections in Steel Castings and Weldments," a film produced by the Steel Founders' Society of America; "Designing Steel Castings To Replace Steel Weldments and Forgings," H. A. Forsberg, vice president, Foundry & Mill Machinery Div., Blaw-Knox Co., East Chicago, Ind.; "Cast-weld Construction and Composite Fabrication," E. J. Wellauer, assistant chief engineer, Falk Corp., Milwaukee, and "Selection of Steel Castings in Preference to Wrought Steel Products or Nodular Cast Iron," J. A. Moseley, SFSA.

A session on "Inspection of Steel Castings for the Desired Quality" had the following papers: "The Importance of the Proper Specification as an Inspection Aid," David Zuege, chief metallurgist, Sivyer Steel Casting Co., Milwaukee; "Service Requirements Set Quality Levels," Kenneth L. Selby, chief engineer, Technical Center of National Malleable & Steel Castings Co., Cleveland; "Process Specifications vs. Quality Specifications," Philip McCaffery, plant manager, General Metals Corp., Oakland Foundry, Oakland, Calif.; "Tolerances for Steel Castings," Paul H. Stuff, chief metallurgist, Ross-Meehan Foundries, Chattanooga, Tenn.; "Standards as a Gage for Acceptance," Francis H. Hohn, metallurgist, Scullin Steel Co., St. Louis; and "What Industry Is Doing To Improve Steel Casting Quality," C. B. Jenni, chief metallurgist, General Steel Castings Corp., Eddystone, Pa.

The session on "High Alloy and Investment Castings" included the following papers: "Specifications and Properties of High Alloy Castings," E. A. Schoefer, executive vice president, Alloy Casting Institute, Mineola, N. Y.; "Selection of Alloys for Corrosive Service," by W. T. Bryan, casting sales manager, Duriron Co., Dayton, Ohio; "Selection of Heat Resistant Alloys," R. A. Miller, chief metallurgist, Electro-Alloys Division, American Brake Shoe Co., Elyria, Ohio.

Three papers on investment castings were presented by William W. Lamb, sales manager, Precision Metalsmiths Inc., Cleveland, and they covered "Specifications and Properties of Investment Castings," "Designing for Investment Castings," and "Examples of Investment Casting Application."

Pittsburgh— Although operations have been reduced to less than 50 per cent of capacity, foundrymen here fear that they haven't hit bottom yet. The downtrend in orders that began a year ago continues, and backlogs are being measured in days. One gray iron shop describes its backlog as "almost a week-to-week proposition." Some foundries continue to work 40 hours, but many are on short weeks, and almost all have had substantial layoffs. Lack of orders forced one big gray iron foundry to shut down for a week in May.

Because of the recession in steelmaking, most mills have cut their capital equipment budgets to the bone. Roll producers have been hit particularly hard. One foundry's roll sales are down 60 per cent. Mill equipment manufacturers are still working close to capacity, thanks to large backlogs. They're getting few orders, but probably have enough work on their books to carry them through the year.

Boston—Slow demand restricts gray iron foundry operations to 50 per cent of capacity in New England. Foundrymen hope for an improved third quarter, but admit there is no concrete evidence to substantiate this view. Malleable shops will coast through June at approximately the same rate; steel foundries will operate 25-30 points higher, but incoming orders are slowing.

Iron shops are without backlogs. They are melting three to four days per week and frequently not over 75 per cent on days they operate. There are few exceptions. The slump in machine tool volume has greatest impact on gray iron shops, although other industries using castings also are slower, including textile and paper mill equipmentmaking.

Not only are foundries in need of volume, but casting prices on a substantial part of available business are subject to competitive pressure. This comes from two sources: 1. Captive shops, some mechanized, narrowing margins to supplement lower integrated tonnage. 2. Smaller

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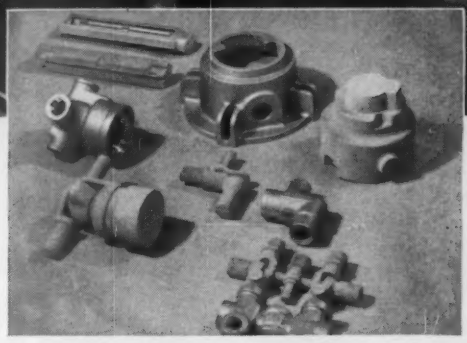

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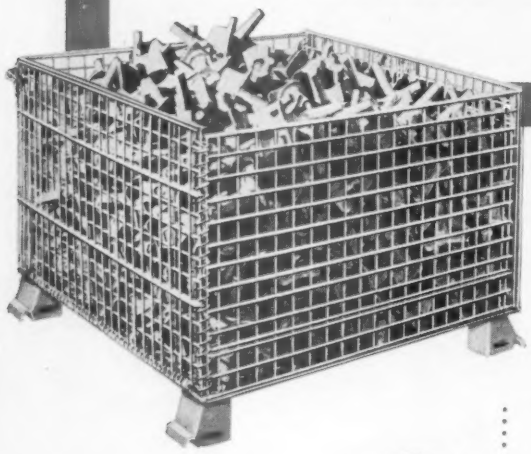

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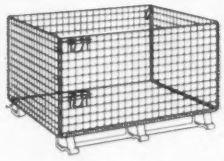

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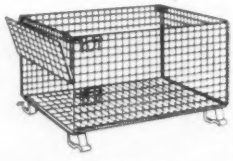

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producers with loose cost systems who barely are breaking even. Latter group has increased ratio of lower cost cast scrap to pig iron in melts. Numerous jobbing shops are caught in this squeeze. Pig iron and scrap shipments are light, with foundries buying raw materials close to near-term requirements. There is no disposition to stock cast scrap at lower prices.

Brass and bronze operations approximate 60 per cent of capacity. Valve volume is off some, but still some points higher than average nonferrous jobbing shops. In this metal, competition also is rampant, but prices are relatively firmer than for iron castings. Some brass and bronze shops outside New England are quoting on volume in this area. Shipyard demand is up slightly.

Chicago—A 7-cent an hour across-the-board increase effective May 1 for about 2000 workers in Chicago area foundries has been agreed on by the Chicago Foundrymen's Association and four locals of the International Molders and Foundry Workers, AFL-CIO.

Negotiations were conducted under a clause in the current three-year contract which permitted reopening this year on wages only. The contract, which expires May 1, 1959, gave an automatic 10-cent an hour increase to molders and coremakers and a 5-cent raise to semiskilled workers on May 1, 1957. The new hourly scale for molders and coremakers is $2.57, and the starting figure for semiskilled workers is $1.92.

The contract covers employees in 30 companies affiliated with the association. Forty other foundries in the area follow the wage pattern of the association.

* * *

Contrary to the trend in many areas of business activity, Armour Research Foundation of Illinois Institute of Technology reports a record dollar volume of research and development contracts in the first half of its fiscal year. The organization performed $7,082,000 in research work, a 5 per cent increase over work in the same period last year.

Dr. Haldon A. Leedy, director, reports that the increase in the foundation's business was reflected in both industrial and government contracts. During the six-month period, new industrial research programs started by the foundation increased 14 per cent over the first half of the previous year.

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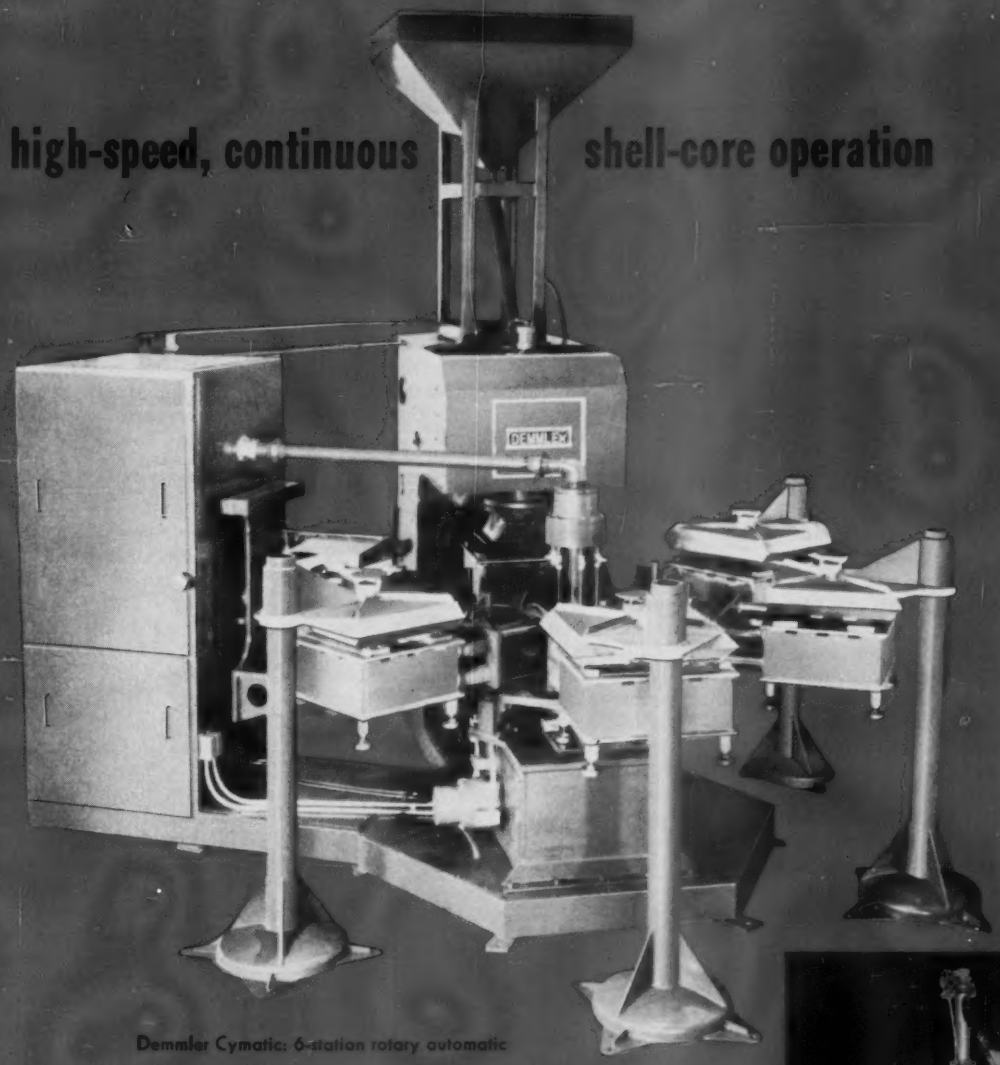

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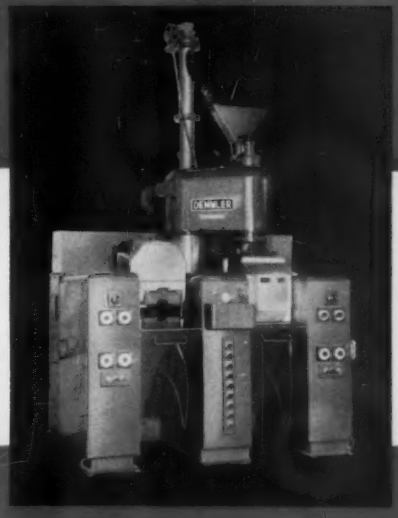

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Circle 638 on Page 117

Foundry Group Meetings

St. Louis—At the AFS chapter's March 13 meeting, Dan Hayes, field director for AFS headquarters, met with the board and also discussed AFS membership with the chapter group.

Ralph Petersen, Central Pattern Co., who was chairman of the chapter's apprenticeship contest, presented awards to the winners of both wood and metal patternmaking apprentices. Dale Arnette, chairman, Arnette Pattern Co., presented apprenticeship certificates and the *Machinery Handbook*.

The St. Louis Chapter has had five first-place winners in national AFS apprenticeship contests in the last 15 years. Paul Niebur, Central Pattern Co., national metal patternmaking division winner, is the latest to take top honors.

Principal speaker at the meeting was A. F. Pfeiffer, 55-year veteran of Allis-Chalmers Mfg. Co., Milwaukee, who discussed "Co-ordinative Function of Pattern Equipment and Castings." The meeting provided a reunion for Mr. Pfeiffer and William Buckler, president, Buck-

WESTERN MICHIGAN UNIVERSITY INITIATES FOUNDRY PROGRAM

A new program of studies in foundry technology at Western Michigan University, Kalamazoo, Mich., was described at a dinner at the school April 2. The meeting was attended by 150 foundrymen from Michigan, Indiana, and surrounding states and was sponsored by the Foundry Industry Advisory Committee of the Department of Industrial Technology.

Robert Huston, vice president, Fuller Mfg. Co., Kalamazoo, and chairman of the General Industry Advisory Committee to the department, presided. Dr. Russell H. Seibert, vice president, Western Michigan University, welcomed the foundry representatives.

Thomas T. Lloyd, vice president, Albion Malleable Iron Co., Albion, Mich., and chairman of the Foundry Industry Advisory Committee, spoke on "Technical Institute Training in the United States," and Dr. Andrew C. Luff, acting head, Department of Industrial Technology, discussed "Industry Oriented Programs at Western Michigan University." Frank G. Steinebach, FOUNDRY, discussed the changes taking place in the foundry industry and how trained technicians will meet future needs. A panel discussion followed.

Top view below shows, left to right, Mr. Luff; Henry Beukema, associate professor of industrial technology, WMU; Mr. Steinebach; Ross Gilmore, president, Superior Steel & Malleable Castings Co., Benton Harbor, Mich., and Steel Founders' Society; Edward J. Walsh, executive director, Foundry Educational Foundation; and Martin Varner, director of training, Central Foundry Div., General Motors Corp., Saginaw, Mich.

The second view shows, left to right, Dr. Siebert; Horace Deane, vice president, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.; Chester V. Nass, vice president, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago, and immediate past president, FEF; Mr. Huston; Mr. Lloyd; Alfred B. Connable, board chairman, Albion Malleable Iron Co.; Sewell Downs, vice president, Clarage Fan Co., Kalamazoo; and Collins L. Carter, president, Albion Malleable Iron Co.

ROYER OFFERS A PRACTICAL SOLUTION TO HOT SAND PROBLEMS

In today's foundry operation, time is probably the most costly element the superintendent must deal with. Sand used for today's casting must be conditioned and ready for use tomorrow. This frequently means sand conditioning at temperatures ranging up to 300° to 400°F.

These destructive high temperature operating conditions seem to plague every foundryman. Foundry equipment suppliers have offered many possible solutions—cooling towers, shake-out belt cooling, water cooling, rotary cooling, bin cooling, etc. But probably no manufacturer has offered more thorough cooling per dollar of invested capital than that obtained with Royer equipment.

All Royer Foundry Units employ the famous Royer Belt Combing Principle. In operation, a combing and mixing action takes place in the feed hopper. This breakdown of the hot sand mass releases the hot gases as the first step

in Royer Cooling. Further cooling of the individual sand particles takes place as the conditioned sand is discharged in an open stream. And finally, the sand heap, now open, light and fluffy, continues cooling at a very rapid rate.

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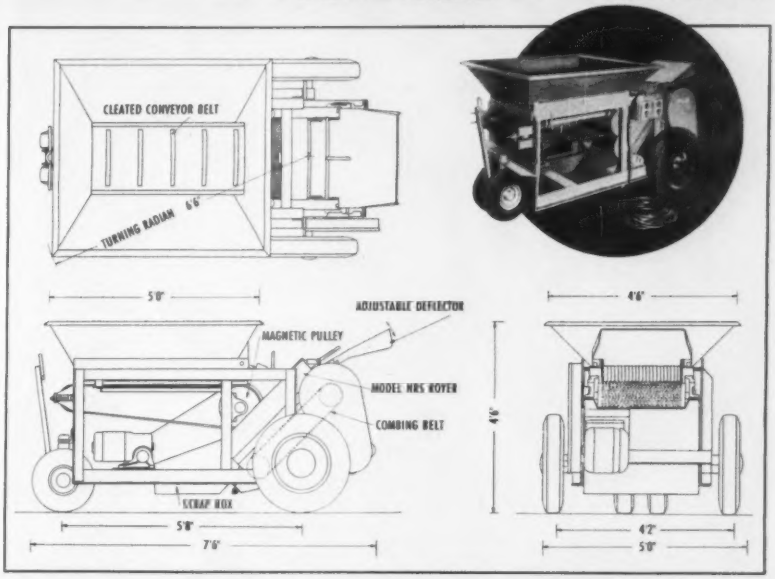

Sand Conditioning costs can be reasonable

When any industry suffers a business recession, however slight, the attention of its leaders automatically shifts to cost cutting and the elimination of waste. Many foundrymen peer wistfully at the large, highly mechanized foundry and imagine semi-automation is the answer.

Looking at the foundry industry realistically, this form of advanced mechanization is not the answer. Seventy-two per cent of the nation's foundries employ less than 50 men—for most of these, advanced mechanization is both a physical and an economic impossibility.

For these foundries, units like the highly efficient Royer MAGNA-SAN are the practical solution to most sand conditioning cost problems. Here is a unit that is foundry-engineered to magnetically clean, mix, blend and aerate shake-out sand right on the molding floor—and at a lower initial cost and with less maintenance than any other mechanical method.

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Capacity-wise, the Royer MAGNA-SAN conditions 45 tons of sand per hour—a full 8 per cent more than its closest competitor. And remember, it is a fact that economy of operation is determined by performance, which is measured by comparative expense per ton of sand conditioned.

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ler Foundry Co., East Alton, Ill., who had been foundry superintendent at Allis-Chalmers from 1938 through 1944.—*H. V. Boemer, Great Lakes Carbon Corp.*

Missouri Student Chapter—Seventy students and eight guests from the St. Louis Chapter were present at the February meeting of the AFS student chapter of the Missouri School of Mines & Metallurgy, Rolla, Mo. Francis H. Hohn, Scullin Steel Co., spoke on "Vacuum Degassing of Molten Metals." He discussed different types of vacuum melting furnaces and the effect vacuum melting has on mechanical properties of metals.

Robert H. Jacoby, St. Louis Coke & Foundry Supply Co., St. Louis, who is industrial adviser for the chapter, presented FEF scholarship certificates to ten students.—*Allan G. Wehr.*

Wisconsin—Newly elected officers to serve during 1958-59 were announced at the Management Night meeting of this AFS chapter on April 11 at the Shroeder Hotel. President is Leslie J. Woehlke, Spring City Foundry Div., Grede Foundries Inc., Waukesha, Wis.; vice president, Lawrence J. Andres, Lawran Foundry Co., West Allis; secretary, Bradley H. Booth, Carpenter Bros. Inc., Milwaukee; and treasurer, Jeff A. Westover, Westover Corp., Milwaukee.

Featured speaker was Senator Karl E. Mundt of South Dakota.—*John E. Hubel.*

New England—April 9 meeting of the New England AFS Chapter was held at the Metals Processing Laboratory, Massachusetts Institute of Technology, Cambridge, Mass., with approximately 150 members present.

Following dinner, Prof. Morris Cohen, Department of Metallurgy, MIT, told of his recent trip to Russia, which included Moscow and Siberia, and described the progress that country has made. He emphasized points in his talk with slides showing Soviet education in metallurgy.—*F. S. Holway, Mystic Iron Works.*

Detroit—A combined International Night and Management Night attracted 300 AFS members from the Detroit-Windsor area to the Prince Edward Hotel at Windsor, Ont., on March 20. Walker L. Cisler, president, Detroit Edison Co.,

NEW . . .

BRASS and BRONZE FOUNDRY PRACTICE

By HARRY M. ST. JOHN

THIS VOLUME brings together in one place the facts and theories of brass and bronze foundry practice. Much material has been published on these subjects, but for the most part it is scattered through a variety of publications. Now brass founders have available a comprehensive, modern treatment of all aspects of brass foundry theory and practice in one source.

The 250 pages of *Brass and Bronze Foundry Practice* cover the entire range of brass foundry operations. Its 23 chapters discuss alloys, technical and operating procedures, quality control, testing, brass foundry economics, cost control, casting design, patternmaking, foundry layout, and salvage of waste material. The text is supplemented by 85 illustrations which clarify and enlarge on the subject matter. A complete index expands the usefulness of the book as a reference work.

Harry M. St. John, author of *Brass and Bronze Foundry Practice*, is exceptionally qualified to make this contribution to the progress of the thousands of foundries producing brass and bronze castings. Most recently, he was associated with Crane Co., where he was superintendent in charge of brass foundry, brass forging, and die casting of aluminum and zinc. He was awarded the William H. McFadden Gold Medal of AFS in 1947, for his many outstanding contributions to the society and to the foundry industry.

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spoke on "The Effect of Atomic Development in the International Detroit-Windsor Area."

To illustrate the tremendous power capacity of nuclear energy, Mr. Cisler compared 3¼ lb of anthracite, which will produce 4¼ kilowatt hours of electrical energy, with a 3¼ lb uranium sample, which will produce 12 million kilowatt hours. The speaker stated that known reserves of nuclear fuels in the world are at least three times greater than the known reserves of coal, gas, and oil. Erection of atomic energy power plants in the Detroit area has generated much local interest, and the discussion was timely.—*Edward A. Swensson, Edwin A. Swensson Co.*

Coated Abrasives Machinery Show Will Be in Troy, N. Y.

More than 50 manufacturers of coated abrasive machine tools will demonstrate their newest developments at a Coated Abrasives Machinery Show to be held June 10-13 in the new product engineering building of Behr-Manning Co., Troy, N. Y., a division of Norton Co. The show will include woodworking as well as metalworking machinery.

Industrial production men are encouraged to bring actual workpieces and test grind them on various machines, comparing machine speeds and pressures, abrasive grits, bonds and backings, contact wheel densities, lubricants, and other variables. Machines will range in size from sheet polishers and big automatic equipment to portable air-driven tools for offhand work.

Floor space will be devoted to machinery demonstrations. Several times daily, brief lectures will be given by Dr. Hugh N. Dyer, Behr-Manning director of product testing. Sessions will also present showings of a new color motion picture on offhand grinding.

Cornell Offers Industrial Engineering Seminars

Ten seminar workshop sessions led by qualified discussion leaders in each of seven major areas of industrial engineering and management are included in the Industrial Engineering Seminars offered by Cornell University. To be held June 17-20, seminars are directed to all levels of management.

Areas to be covered include industrial management, manufactur-

ing engineering, small plant management, methods and work measurement, data processing systems, applied industrial and engineering statistics, and statistical aspects of component reliability.

Fee is $120 per person, payable in advance. For further information, write to J. W. Gavett, seminars co-ordinator, Upson Hall, Cornell University, Ithaca, N. Y.

Apprenticeship Conference To Be Held June 23-26

Training of skilled craftsmen will be the theme of the 14th annual Eastern Seaboard Apprenticeship Conference, to be held June 23-26 at Griswold Hotel, Groton, Conn. Foundry section meetings will be at 2 p.m., June 24, and at 10 a.m., June 25. Foundry organizations from Maine to Virginia have been invited to attend, and the program will include outstanding representatives of the foundry industry.

The conference is sponsored by the Connecticut State Apprenticeship Council and apprenticeship councils of Massachusetts, Vermont, New Hampshire, New York, Maine, Rhode Island, New Jersey, and Pennsylvania, in co-operation with the Bureau of Apprenticeship and Training, U. S. Department of Labor, Region 1 and 2.

Quality Control Course Is Offered at Purdue

An advanced short course in Quality Control by Statistical Methods will be held at Purdue University June 10 to 20. Subjects to be covered in the ten-day period include significance tests and estimation, linear and multiple correlation and regression, single and sequential sampling for measurements, and analysis of variance. A simplified and practical approach is used.

For more information, write to Professor Irving W. Burr, Statistical Laboratory, Purdue University, Lafayette, Ind.

Wooden Pallet Care Explained

Proper care and maintenance of wooden pallets is explained in a 16-page pamphlet published by the National Wooden Pallet Manufacturers Association. It is intended to show users how to prevent damage to pallets and how to repair damaged ones. Free copies are available from pallet suppliers or through the association, 609 Barr Bldg., Washington 6, D. C.

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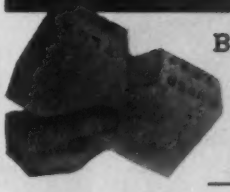

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Circle 649 on Page 117

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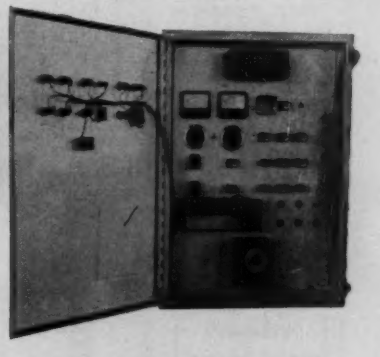

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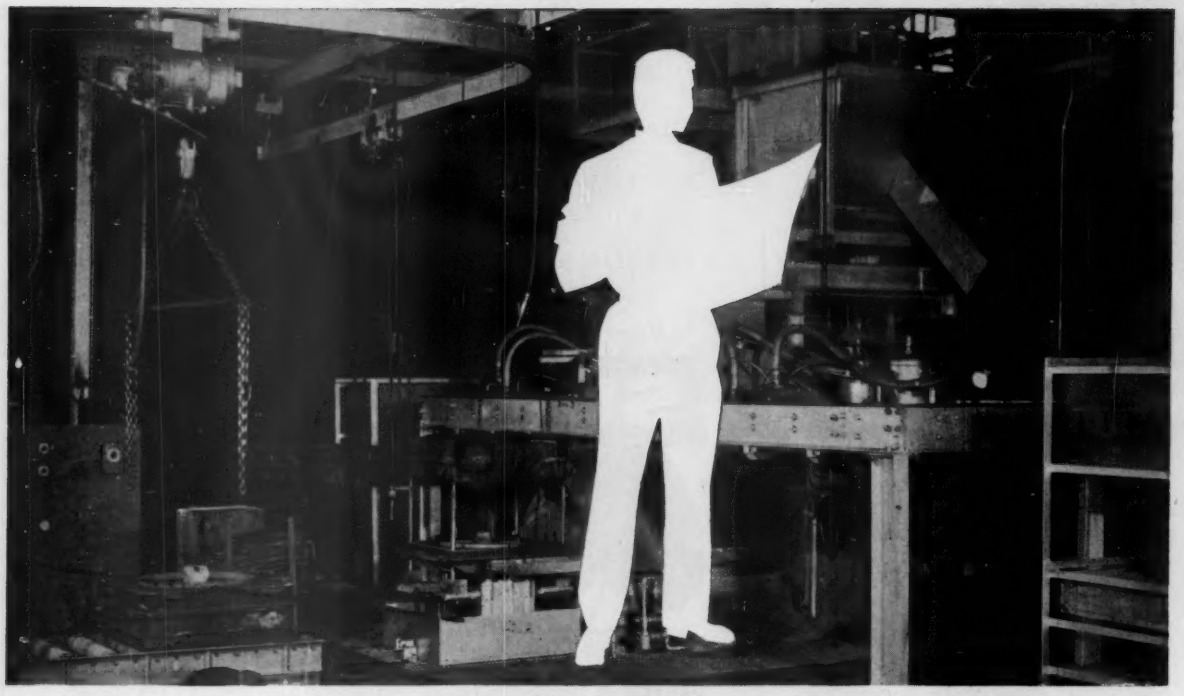

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Thoroughly educated in the basic sciences and engineering fundamentals, he brings to your organization the technical potential so necessary for successful foundry operation.

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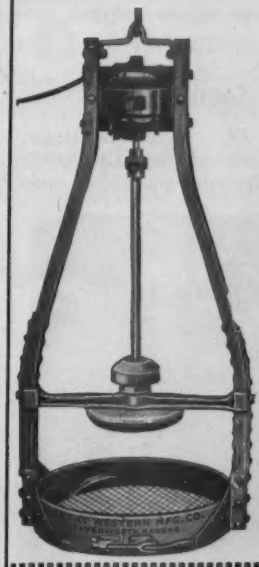

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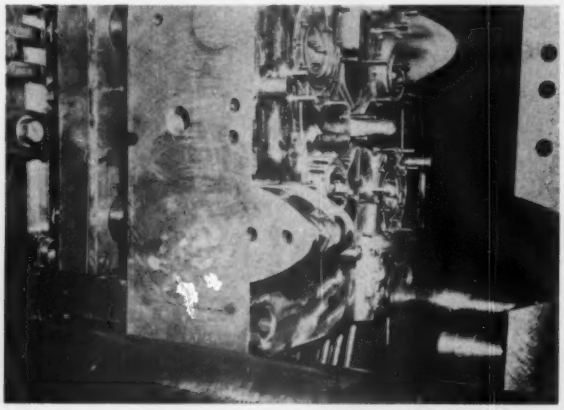
Circle 658 on Page 117

Circle 659 on Page 117

The Shakeout

Cast Die Block Replaces Forging

MORE THAN $1200 was saved when Congress Die Casting Div., Tann Corp., Detroit, used a cast-to-shape retainer in place of a forged die block to hold automotive horn dies. The Forging & Casting Div.,



Allegheny Ludlum Steel Corp., supplied the steel, which is designated FC CMS. It is an oil or air-hardening steel most commonly provided in cast-to-shape form.

The cast block weighed only 650 lb, or 600 less than the 1250-lb forged block it replaced, for a material saving of more than $250. In addition, Riehle Machine Co., Toledo, Ohio, builders of the die, eliminated 150 hours of machine time worth $1000.

For More Details Circle No. 439—Page 151

Develops Corrosion-Resistant Coating

RESEARCHERS at Los Angeles Div., North American Aviation Inc., have developed a low-cost liquid preservative to prevent corrosion of airplane assemblies and

parts undergoing IRAN (inspect and repair as necessary) work for the U. S. Air Force.

Sprayed on, the preservative, tradenamed Sabrex, can be "sprayed off" with an inexpensive petroleum solvent, as shown here. It also can be removed by steam cleaning, although it resists rain and weather. A nonoxidizing, wax-type material, it protects both ferrous and nonferrous metals, and a coating lasts from four months to a year depending on the type used. The material is expected to have wide use in all types of manufacturing.

For More Details Circle No. 440—Page 151

Air Hoist Application Shows Versatility

IN AN UNUSUAL foundry application, an air hoist is being used, as shown here, for fast transfer of weights and trays from one roller conveyor line to a parallel conveyor line.

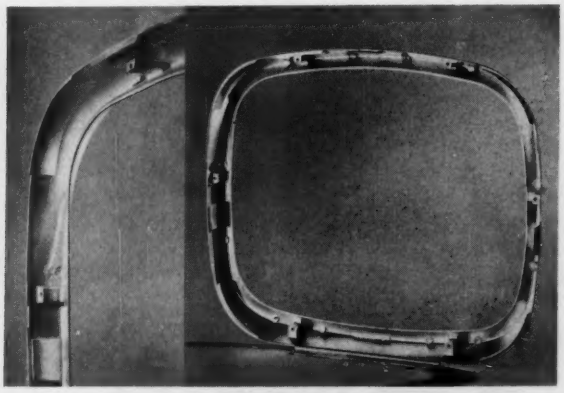
The hoists, which are made by Keller Tool Div., Gardner-Denver Co., Quincy, Ill., are mounted to stationary supports midway between the two conveyors. A weight is picked up from a poured mold and swung

across the position on a new mold in one continuous action in this shell molding operation. The weights hold halves of the shell molds together during pouring.

For More Details Circle No. 441—Page 151

Zinc Diecasting Is Both Strong and Light

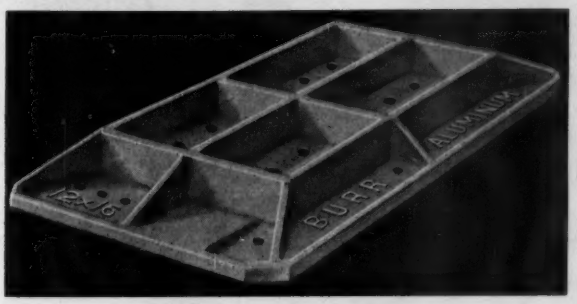
A ZINC diecast bezel and screen mask for a portable television receiver weighs less than 1 lb, yet has sufficient strength and rigidity to permit its use as a structural part of the entire housing. Use of a high-strength,



zinc-alloy diecasting effects further weight and cost economies by permitting the use of a thinner gage of steel in the cabinet and eliminating the need for strengthening frames.

For More Details Circle No. 442—Page 151

BEST BY TEST



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Circle 660 on Page 117

The Cupola and Its Operation

A comprehensive text on cupola operation for the metallurgist, foundryman and student of foundry technology . . . . . .

The 35 chapters are grouped into the following sections: Operations, Equipment, Materials, Principles related to Operation.

Latest developments, such as hot blast, basic lining for nodular iron, and emission control are covered. Chapters such as those on refractories, principles of combustion, and metallurgy have been greatly augmented or are presented for the first time. More than 50 of the country's outstanding foundrymen have contributed their knowledge and experience to make this book available on cupola operation.

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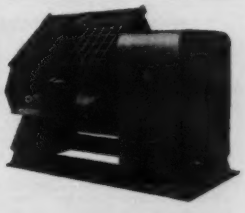

Circle 661 on Page 117

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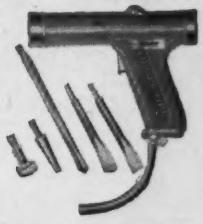

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CLASSIFIED ADVERTISING

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A Foundry Research Metallurgist with a minimum of a B.S. degree and 5 years of experience in foundry operations plus an excellent knowledge of the fundamentals of metal casting is required for a challenging and creative research assignment. Clear analytical thinking and articulate writing ability is an essential requisite for this position.

Located in the Chicago metropolitan area, we offer a generous relocation allowance, excellent employee benefits in addition to an outstanding opportunity for advanced educational training and professional recognition. Salary commensurate with experience.

All replies will be treated as confidential. Please send complete resume to:

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Position requires administrative ability to coordinate entire foundry operation. Broad experience in all phases of production involving large number of pattern changes. Age no barrier for the right man. Benefits above average.

Send full resume of experience and qualifications with recent photo if possible. All replies will be treated confidentially.

BOX 102, FOUNDRY

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FOUNDRY METALLURGICAL ENGINEER

Foundry metallurgical engineer wanted for nonferrous foundry. Must have experience on problems of gating, risering, pouring, sands and cores. B. S. Degree in Engineering required. Must have minimum of five years' experience. Age 25-45. Excellent opportunity for capable and energetic man. Salary open. Please reply stating your personal data, qualifications, experience, salary expected and availability in first letter. All inquiries will be held in strict confidence. Direct all correspondence to: AMPCO METAL, INC., PERSONNEL DEPARTMENT, 1745 SOUTH 38 STREET, MILWAUKEE 46, WISCONSIN.

HELP WANTED

Nonferrous foundry in northwest Pennsylvania needs foundry superintendent. Must be experienced. Give references. Address: Box 986, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

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Excellent opportunity for man with broad knowledge and experience in complete steel foundry practice and production in foundry engaged in production of high quality carbon and alloy steel pressure containing castings with broad range reaching several tons. Complete facilities including electric arc and induction melting facilities, molding, coremaking, heat treating and welding.

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CLASSIFIED ADVERTISERS

PLEASE NOTE!

Our next issue is the special Post-Convention issue — July. Copy for this issue must reach us no later than June 13th. Thank you for hurrying copy to us and remembering: it pays to advertise in FOUNDRY's Classified!

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Thorough knowledge of all phases of nonferrous metals. Understand gating, jobbing, floor, machine and plumber supplies. Can also produce pressure tight and porous free castings. Know sand control and core room work. Address: Box 977, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Progressive foundryman familiar with every phase of practical experience on all classes of work. Now employed. Would like to make change. Address: Box 996, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Experienced in cleaning and finishing Steel and Alloy Castings, weighing 1 to 500 pounds. Prefer Ohio, Pennsylvania, or Eastern States. Address: PETER WORTHY, 940 FRANKLIN ST., McKEESPORT, PENNSYLVANIA.

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FOUNDRY has 75,000 readers. They represent a readership which covers the entire foundry industry. What does this mean to a classified advertiser? It means that for a nominal sum you get the widest possible coverage of the industry. Your message reaches "just the right people".

classified
advertising dept.
Foundry ★
Cleveland 13, O.

CLASSIFIED ADVERTISING

Foundry For Sale

FOUNDRY FOR SALE

Aluminum, brass foundry in southwest, center of rapidly expanding electronic and aircraft industries. Two acres industrial property, building, and equipment to pour 3000 lbs. aluminum daily. Owner lacks operating capital. Price $45,000. Address: Box 993, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

For Sale

FOR SALE OR LEASE

ALUMINUM AND IRON FOUNDRY EQUIPMENT

Furnaces, Blowers, Flasks, etc.
250 Aluminum Match Plates
All Popular Old Lace Grillwork Patterns
Lawn Furniture Patterns

BOX 961, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

ROTOBLAST

Pangborn, Model ES-223, 4-position complete with motors, component parts and installation prints. On skids. Original cost approximately $20,000. For quick deal FOB cars $3500.00.

GENERAL MACHINERY & EQUIPMENT CO., INC.
809 WOODLAND AVENUE
KANSAS CITY 6, MISSOURI

DETROIT ROCKING—ARC FURNACE

Model GM, 60 pound, 36 KVA, complete with transformer control panel and extra shell, very good condition. Address: RENSSELAER POLYTECHNIC INSTITUTE, TROY, NEW YORK.

For Sale

FOR SALE

#1½ SIMPSON MIXER—WITH LOADER
UD Model—Ser. 32907 ..... $3500.00
TABOR JOLT ROLLOVER MOLDING MACHINE, 30" x 40"; 12" draw; shockless; 1000# cap. 650.00
WORTHINGTON AIR COMPRESSOR, 6 x 7, 15 HP; Ser. #L 51311 ..... 950.00
GARDNER HORIZ. DISC GRINDER, 54"; 20 HP 650.00

Also other foundry equipment

FOR THE BEST DEAL CALL
BALCHER MACHINERY COMPANY
695 E. 152nd Street
Cleveland 10, Ohio
Telephone: GLenville 1-2474

FOR SALE

1—Simpson #0 Muller—Style M (never used).
1—Lancaster Stainless Steel Counter-Current Batch Mixer, Type LW-62.
1—Lancaster Mixer, Model EBG-4.
1—Lancaster Mixer, Model EAG-3.
1—Ingersoll Rand Air Compressor, Type PRE-2, 24" x 16", 100# pressure with 300 HP motor.
3—Link Belt Roto-Louver Rotary Dryers, Models: 207-10; 310-16 and 502-20.

R. GELB & SONS, INC.
U. S. HIGHWAY 22, RAHWAY VALLEY R.R.
UNION, NEW JERSEY

FOR SALE

2—Screenarators—Beardsley & Piper, large and medium, excellent condition, $600 and $350
3—Jolt squeeze machines, Osborn, $125 each
2—Shell closing machines, Auto Timers, used three months, $300 each
Oscillating conveyor, Link Belt Flexmont, 12" trough, 50' long, $400
1—16' Handy Handler belt conveyor for unloading sand cars, $155
1—Two ton steel furnace in perfect condition, melting time approximately 75 minutes per ton. Firm price, $8,000

BAMBER FOUNDRY, INC.
MARKET STREET
STAMFORD, CONNECTICUT

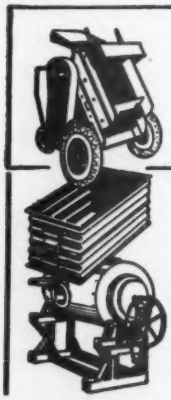
For Sale

FOR SALE

Simpson No. 1 Muller
Simpson No. 1½ Muller
Simpson No. 2 Muller with loader
American Tumblast, 27 x 36 with loader
American Tumblast, 36 x 42
Fisher Furnaces #600 MNP
Coulter Furnaces #400 MNP
Osborn #405 Rollovers
Elevators
Belt Conveyors
Shakeouts
Milwaukee 165 Pin Lift
International Rollover RES
Milwaukee 163 Jolt Stripper
Champion JSL 12 Pin lift, jolt
Osborn 710J, pin lift
Osborn 212J, Jolt Squeeze
Osborn 275J, Jolt Squeeze
Osborn 276J, Jolt Squeeze
International LJS, Jolt Squeeze
International PJS, Jolt Squeeze
Milwaukee 104 Jolt Squeeze
Champion JS 10S Jolt Squeeze
Arcade 100S Jolt Squeeze
Spo 110 Jolt Squeeze
Davenport Rollover 28 SA
International Rollover 30 x 8 portable
International Rollover 2410 G portable
International Rollover 30 x 8 no jolt
Tabor rollover 30 x 40 portable
J & J 610 B rollover portable
International pin lift
Davenport pin lifts
Osborn 559 pin lift
Spo 506 jolt rollover, pin lift, draw
Nichols plain molding machine, high speed
International plain jolt, 36 x 45 table
International Type R core rollover, hand
Swing Grinders
Royer sand preparators
Simplicity preparators
B & P preparators
Blystone sand mixers
Coleman core ovens
Porbeck core ovens
Grinders ½ hp to 25 hp
Disc grinders
Ladles from 50 lb. to 10,000 lb.
Pouring Devices 500 lb. to 2000 lb.
Gyratory riddles
Monorail and bridges
Air Hoists 250 lb. to 10,000 lb.
Overhead chain conveyor #458, track, drives, etc.
Blowers-Centrifugal-positive-exhaust
Dust collectors all sizes

FLASKS
ALUMINUM
SLIP and POP
Sizes from 10" x 10" to 48" x 48"
JACKETS
Aluminum and Iron
STEEL FLASKS
Sizes from 10" x 15" to 9' x 9'
CORE PLATES
Transite —— Iron —— Aluminum

MANY OTHER ITEMS IN STOCK
SEND US YOUR INQUIRIES
WE BUY — SELL — TRADE
THE HOMAN MACHINERY CO.
710 E. FRONT ST. MAIN 10339
CINCINNATI 2, OHIO



EUCLID FOUNDRY & MACHINE EQUIPMENT CO.

14919 SARANAC ROAD CLEVELAND 10, OHIO

OSBORN ROLLOVERS:
4—405, 18" draw, air clamps, 3500# cap.

WHEELABRATORS
1—20" x 27" 2 cu. ft. Tumblast
1—27" x 36", 5 cu. ft. Tumblast, w/loader
1—36" x 42", 11½ cu. ft. Tumblast, w/loader
1—42" x 48", 17½ cu. ft. Tumblast, w/loader
1—36" x 42" air blast Wheelabrator

PANGBORN
1—18 cu. ft. Rotoblast Master, w/loader

SAND SLINGERS
1—B-P Riddle type, 19" head, 4" tip
1—B-P Motive Jr., 19" head, 4" tip
1—B-P double belt, 19" head, 4" tip

SWING GRINDERS
10—10 H.P. Mummert-Dixon Model 1814
3—25 H.P. Safety Grinding Wheel Model 204

ELECTRIC FURNACES:
1—80 lbs. Detroit Rocking
1—350 lbs. Detroit Rocking

ASK FOR OUR COMPLETE LISTING — GLENVILLE 1-1222

Circle 906 on Page 117

For Sale

SAND BLAST EQUIPMENT
SELL-BUY-TRADE
GUARANTEED MACHINES
TERMS: 3 YEARS TO PAY

6' LF-14 Pangborn Table	$2000.00
9' LG-14 Pangborn Table	4500.00
Pangborn 8 x 10 Room	2800.00
Pangborn 53 EN2 Hand cabinet	325.00
Pangborn Auto Peening cabinet	1100.00
48 x 48 Wheelabrator Tum. w/loader	5000.00
42 x 48 Wheelabrator Tum. w/loader	2500.00
27 x 36 Wheelabrator Tum. w/loader	2250.00
20 x 27 Wheelabrator Tum.	2000.00
15 x 20 Wheelabrator Tum.	1500.00
15" Continuous Wheelabrator Tumblast	1000.00
8' Wheelabrator Table Blast	2000.00
7GK2 Pangborn Rocker Barrel	2000.00
14 LG5 Pangborn Rotoblast Multi-Table w/5—5' tables	9000.00
Pressure Tanks, all types	150.00 up
Vapor Blast cabinets	400.00

All types and sizes of Hand Cabinets, Dust Collectors, Pressure tanks, Rooms, Horizontal or Vertical Tumbling Barrels and additional Sand Blast Equipment too numerous to mention.

DIAMOND SALES, INC.
5654 W. Jefferson
Detroit 9, Michigan
VI-36750

We will Buy one piece or your entire plant; or represent you at any auction at a savings to you.

CUPOLAS FOR SALE

J. W. Paxon #9 with 72" shell diameter. Also Whiting size 3½. Make offer. Address: BERGEN MACHINE & TOOL CO., 189 FRANKLIN AVE., NUTLEY, NEW JERSEY.

For Sale

CLASSIFIED ADVERTISERS
PLEASE NOTE!

Our next issue is the special Post-Convention issue — July. Copy for this issue must reach us no later than June 13th. Thank you for hurrying copy to us and remembering: it pays to advertise in FOUNDRY's Classified!

FOR SALE

MOTORS—GENERATORS
TRANSFORMERS
Unused—Rebuilt
WORLD'S LARGEST INVENTORY
ELECTRIC EQUIPMENT COMPANY
Phone station Collect GLenwood 3-6783
P. O. Box 51—Rochester 1, New York

FURNACES FOR SALE

Ten used heat treating furnaces and two 7-ton gantry cranes. Good condition, priced to sell. Address: BAER STEEL PRODUCTS, INC., BOX 1428, BOISE, IDAHO.

For Sale

FOR SALE

All of our foundry equipment, including two electric furnaces, cupolas, compressors, Wheelabrators, Surface Combustion box type oven, core ovens, molding machines, casting bins, in fact our complete foundry.

MEMPHIS CASTING WORKS, INC.
1006 OAKLAND AVENUE
MEMPHIS 1, TENNESSEE

FOR SALE

1—Type 25, Size 8000 CFH DX Surface Combustion gas generator. Purchased new 1956. Never used. Price $5950.00.

ALBION MALLEABLE IRON COMPANY
ALBION, MICHIGAN

SHELL MOLDING MACHINE

Late model Shell Process automatic molding machine—pattern size 20" x 30", gas fired, 220-60-3, excellent condition, operating now.

J. T. MOORE
WELLS MANUFACTURING COMPANY
SKOKIE, ILLINOIS

CLASSIFIED ADVERTISING RATES

(Effective July 1, 1958)

POSITION WANTED—Minimum advertisement set solid, 30 words or less, $3.50. Additional words 15c each.

ALL OTHERS — "Help Wanted" — "For Sale" — "Wanted-To-Buy", etc., minimum advertisement set solid, 30 words or less, $8.00. Additional words 30c each.

NOTE—If replies are to be sent to a box number in care of FOUNDRY, add 8 words to your advertisement for box number and address.

Any advertisement set in all capital letters, add 50% to the above rates.

INCH RATES PER INSERTION

Single Column 2¼" Wide	One Time	Three Times	Six Times	Nine Times	Twelve Times
1 inch	$ 22.20	$ 21.00	$ 19.80	$ 19.20	$ 18.60
2 inches	43.20	40.80	38.40	37.20	36.00
3 inches	63.00	59.40	55.80	54.00	52.20
4 inches	81.60	76.80	72.00	69.60	67.20
5 inches	99.00	93.00	87.00	84.00	81.00
6 inches	115.20	108.00	100.80	97.20	93.60
7 inches	130.20	121.80	113.40	109.20	105.00
8 inches	144.00	134.40	124.80	120.00	115.20
9 inches	156.60	145.80	135.00	129.60	124.20
10 inches (1 col.)	168.00	156.00	144.00	138.00	132.00
15 inches (½ page)	243.00	225.00	207.00	198.00	189.00
20 inches (2 cols.)	312.00	288.00	264.00	252.00	240.00
30 inches (full page)	450.00	414.00	378.00	360.00	342.00

Remittance should accompany advertisement when submitted —Cash Discount 2%, 10 days.

Classified Forms Close the 13th of Month Preceding Issue

FOUNDRY

PENTON BUILDING • CLEVELAND 13, OHIO

PUBLIC AUCTION SALE

BY ORDER OF SOMERVILLE IRON WORKS, CHATTANOOGA, TENNESSEE

First Day: **Tuesday, June 3, 1958, Tennala Pipe Company, Rockwood, Tennessee, At 1:00 P.M. E.S.T.**

STATIONARY SAND SLINGERS & PLATE FEEDER

MODEL DB, 6' arm, 4' ram, 19" head, 4" tip, 20 hp motor. Serial #S-628-514. New 1951.
BEARDSLEY & PIPER MODEL DB, 6' arm, 4' ram, 19" head, 4" tip, 25 hp motor. Serial #S-503. New 1946.
BEARDSLEY & PIPER 5 TON PLATE FEEDER.

CONVEYORS & BUCKET ELEVATORS

35' BUCKET ELEVATOR, 12" belt, 12" x 6" buckets, motor driven.
115' x 18" x 4 PLY BELT CONVEYOR.
90' x 18" x 4 PLY BELT CONVEYOR.
20' x 18" x 4 PLY BELT CONVEYOR.
APPROX. 450'-18" ROLLER GRAVITY CONVEYOR.

CUPOLAS & LADLES

#6 WHITING CUPOLAS, cap 7½ to 10¾ TPH w/skip loader.
#5 CUPOLA, cap 5 TPH w/skip loader.
WHITING MIXING LADLE, 2000 lbs.

TUMBLING BARRELS

48" x 74", ball bearing, gear motor drive, 15 hp.
52" x 62" HORIZONTAL, gear motor drive, 10 hp.
(3) 36" x 72" HORIZONTAL, belt drive.

AIR COMPRESSORS

HARDIE-TYMES DUPLEX HORIZONTAL, 650 cfm pressure 100 lb., 125 hp synchronous motor 3/60/220, intercooler, aftercooler, exciter.
9" x 8" CHICAGO PNEUMATIC HORIZONTAL, 220 cfm pressure, 40 hp motor.

SAND MULLERS

#2 SIMPSON MIXER, cap 14 cu. ft. 15 hp motor.

JOLT SQUEEZE PIN LIFT MACHINES

(8) #165-6B MILWAUKEE TABLE, 24" x 30"—10" cyl.
(2) #125-3 MILWAUKEE TABLE, 21" x 27"—12" cyl.
(2) #2114 G. SPO TABLE, 26" x 27"—11" cyl.
(2) TABOR JOLT SQUEEZER, table 14½" x 20".

Second Day: **Wednesday, June 4, 1958, Somerville Iron Works, Manufacturers Road, Chattanooga, Tennessee, At 10:30 A.M. E.S.T.**

COPE & DRAG MACHINES

(2) TACCONE PNEUMATIC COPE or DRAG MACHINES, with traverse, sand metering car, hopper, exhaust blower controls, flask size 34" x 79", 6—2" and 4—3" and 4" pieces to each mold, cap. 100 molds per hour, could be used to mfr. cast iron fittings. New 1951.

FLASKS FOR COPE & DRAG MACHINES

(26) SETS 34" x 79" MEEHANITE FLASKS, 4—3" and 4" molds in each flask.
(10) SETS 34" x 79" MEEHANITE FLASKS, 6—2" molds to each flask.

SPEEDMULLERS

#80A B & P, cap. 24 cu. ft., motor 125 hp, with hopper, mulitromatic and starting controls, water meter, Serial #80A-233-5212.
#80 B & P, cap 24 cu. ft., motor 100 hp A.C., with sand storage tank, air operated, metering car, controls, Serial #80-34.
#50 B & P, 9 cu. ft., 50 hp, with skip hoist, water meter, Serial #50-138-503.
SIMPSON #1—4 cu. ft. cap, 5 hp motor.

CONVEYORS

12 overhead flat and trough belt conveyors, up to 200' long. Various widths.

BUCKET ELEVATORS

6 Jeffrey bucket elevators. Various sizes.

VIBRATING SCREENS

4' x 10' HEWITT-ROBINS, single deck.
4' x 10' HEWITT-ROBINS, double deck.

CUPOLAS

(3) #10 WHITING CUPOLAS, capacity 19 to 23¾ ton.

LADLES

(3) WHITING U TYPE MIXING Ladles, cap. 4 ton, gas preheated, hydraulic tilt.

DUST COLLECTORS

SLY, with 15 hp exhaust blower.
SLY, with 25 hp exhaust blower.
TYPE W ROTO CLONE, type C hopper re-cleaner, size 24 Precipitator.

PRESSURE BLOWERS

TYPE FS INGERSOLL-RAND MOTOR BLOWER, cap. 13000 CFM, pressure 2#, 150 hp motor.
(3) #6½ CONNERSVILLE PRESSURE BLOWERS, 100 hp A.C. motor, 3/60/220, and compensator.

AIR COMPRESSORS

CLASS O CHICAGO PNEUMATIC SIMPLATE HORIZONTAL DUPLEX, cap. 950 cu. ft., 100 lb. pressure, size 19½" x 12" x 12", rpm 300, 200 hp Westinghouse synchronous motor, 3/60/440, with intercooler, aftercooler, exciter, 5'6" x 18"- vertical air receiver, aqua-tower, Serial No. 52040. New 1951.
CLASS TB CHICAGO PNEUMATIC HORIZONTAL, cap. 300 cu. ft., 100 lb pressure, size 12" x 11", 60 hp motor.
CLASS 3A PENNSYLVANIA HORIZONTAL, cap 200 cu. ft., 100 lb. pressure, size 9" x 10", 40 hp motor.

OVERHEAD TRAVELING CRANES & RUNWAYS

APPROX. 18'6" SPAN OVERHEAD TRAVELING CRANE, 5 ton Shaw Box hoist, floor control, 120' runway. A.C.

LIFTING MAGNETS

TYPE W, SIZE 5-55" D.C. EC & M, all welded, 230 volts. New 1955.

FORK LIFT TRUCKS

(4) MODEL Y60 CLARK YARDLIFT HYDRAULIC, cap 6000#, gasoline driven, lift 96", forks 60", dual front wheels, pneumatic tires, Serial #Y60206KE87. New 1955.
MODEL 6024 CLARK YARDLIFT HYDRAULIC, cap u000#, gasoline driven, lift 96", length of forks 60", dual front wheels, pneumatic tires, Serial #Y60205KE87. New 1955.
(3) MODEL 40 CLARK HYDRAULIC, cap 4000# & 6000#, gasoline driven, lift 60", forks 42", rubber tire wheels.

MATERIAL HANDLING EQUIPMENT

(5) MODEL TT CLARK TRUCKTRACTORS, with 2000# cap hydraulic dump body, pneumatic tires.
MODEL 12B MICHIGAN TRACTOR SHOVEL, torque converter, with 50"—16 cu. ft. bucket hydraulic, pneumatic tires, new 1957.
(2) MODEL HA HOUGH, pneumatic tires, 1000# cap bucket, hydraulic.
(2) MODEL FF BUDA CHORE BOYS, cap 2000#, pneumatic tires.

MOBILE EQUIPMENT

1953 INTERNATIONAL TRACTOR, MODEL R205, 6 cyl, 142" wheelbase, 5 speed transmission, double reduction rear axle, air brakes and trailer connections.
FREUHAUF 8' x 32' TANDEM TRAILER, open top, cap 4500#.
FREUHAUF 8' x 32' SINGLE AXLE TRAILER, open top.
1951 WILLYS JEEP, 4-wheel drive.
1951 PLYMOUTH STATION WAGON.

SHAKEOUTS

4' x 8' ALLIS CHALMERS FOUNDROMATIC, 7½ hp.
4' x 12' HEWITT-ROBINS, 10 hp motor.

SLY TUMBLING BARRELS

(8) 42" x 70" HORIZONTAL, geared.
(4) 40" x 60" HORIZONTAL, geared.
36" x 72" HORIZONTAL, geared.

CHARGING CRANES

(2) WHITING 5-TON CAP CHARGING JIB CRANES, A.C.
(7) 4' x 4' cone bottom charging buckets.

PLATE FEEDERS

SAND STORAGE TANK, cap 62 ton, 5 hp A.C.
(4) SAND STORAGE TANKS, cap 27½ ton, 5 hp A.C.

WOODWORKING MACHINERY

20" FAY & EGAN ROUND HEAD PLANER.
12" PARKS ROUND HEAD JOINTER.
18" FAY & EGAN ROUND HEAD JOINTER.
FAY & EGAN WOOD TURNING LATHE
FAY & EGAN SAW TABLE, 30" x 54" tilting table.
(2) 20" DELTA BAND SAW, 20" x 24" tilting table
6' ATKINS SWING SAW
18" CRESCENT DISC SANDER
6" DELTA HORIZONTAL BELT SANDER

MACHINE TOOLS

18" x 104" CENTERS LEBLOND, 12 speed range 156/525 rpm, motor in base.
22" x 104" CENTERS NATIONAL qcg, double back gear.
24" x 96" CENTERS AMERICAN, mounted on riser blocks to swing 32", qcg.
18" x 98" CENTERS LEBLOND qcg, equipped.
11" x 30" VERNON qcg with 3 & 4 jaw chucks, taper attachment, steady rest.
MODEL A 9" x 3½' SOUTH BEND BENCH LATHE, qcg. Serial #183308.
#2 OESTERLEIN UNIVERSAL table 8½" x 45", travel longitudinal 28".
#3G KEMPSMITH PLAIN, quick change feeds, 18 speeds, table 11½" x 57". Serial #11667.
MODEL V36-36" DO ALL CONTOUR, motor in base, with speed indicator, welding & grinding attachments, Serial #36484407.
(2) MODEL 8M WELLS HORIZONTAL METAL BAND SAWS,
4'11" COLUMN AMERICAN TRIPLE PURPOSE, 24 spindle speeds, 48 to 650 rpm, with Universal box table.
3'9" COLUMN SILVER RADIAL DRILL.
28" GOULD & EBERHARDT SHAPER, V-ram, back gear, 8 speeds, 3 hp motor, table support & 14" swivel vise.
24" CINCINNATI, back gear, & 14' swivel vise.
24" CINCINNATI, back gear, power feed, 16" vise table, equipped for tapping.
3—16" DELTA DRILL PRESS, 1/3 hp motor
2—14" CRAFTSMAN DRILL PRESS, ½ hp motor.
28" MINSTER, hi-duty, qcg, cap 2½", 20" x 22" adjustable table, 7½ hp.
22" WEIGEL DRILL PRESS, back gear, power feed.
(2) 18" BAKER DRILL PRESSES
36" x 42" x 12' CLEVELAND OPENSIDE w/swivel head on crossrail, side width of table 33"
30" x 30" x 8' CINCINATI DOUBLE HOUSING swivel head on rail, width of table 24"
#24—52" GARDNER HORIZONTAL, 15 hp motor
#6—7½ HP BADGER DOUBLE END SNAGGING
(2) 24" DOUBLE END SNAGGING GRINDERS

Sale Under Management of

INDUSTRIAL PLANTS CORP.

Auctioneers Liquidators Appraisers

90 West Broadway, New York 7, New York BArclay 7-4184

Chicago, Illinois **Toledo, Ohio** **Detroit, Michigan**

THE ACME BARGAIN PAGE

AIR COMPRESSORS
2—INGERSOLL RAND 450 cfm., 100 hp., 220-440 V.
1—CHICAGO PNEUMATIC 225 cfm., 50 hp., 220-440 V.

BELTING
29" x 180' 24" x 152'
24" x 263' 24" x 120'

BLOWERS
GE 10500 cfm., 20 oz., 85 hp., 220 V.
GE 7500 cfm., 20 oz., 59.6 hp., 220-440 V.
GE Centrifugal 6200 cfm, 24 oz., 58 hp. motor
INGERSOLL-RAND 4000 cfm., 60 oz., 100/25 hp., 220-440 V.
SPENCER 2250 cfm., 16 oz., 15 hp., 220 V.
SPENCER 2850 cfm., 16 oz., 20 hp., 220-440 V.
SPENCER 270 cfm., 8 oz., 3 hp., 220-440 V.

CONVEYOR OVERHEAD CHAIN
1700' JERVIS B WEBB and LINK-BELT #678 with trolleys 36" centers. 2-5 hp. Variable speed caterpillar drives, & motor generator set, takeups and turns.

CONVEYOR
36" x 162' LINK BELT Oscillating Pan 10 hp., 220-440 V.
36" x 55' LINK BELT Oscillating pan.
17' BARBER GREEN Bucket Conveyor.
30" x 25' Magnetic Belt Conveyor w/drives, 2 hp., 220-440 V.
18" x 10' Steel Apron Conveyor w/drives, 3 hp., 220-440 V.
16" x 120' Rubber Belt w/drives.

CORE BLOWERS
REDFORD #2 up to 5# cores
REDFORD Bench types, horizontal or vertical clamping
2—CB15 up to 55# cores, Universal blow plate
C.E. 10 up to 12# cores, 4½" draw.
DEMMLER #4 up to 250# cores.
DEMMLER #3 up to 35# cores.
INTERNATIONAL SB15H, up to 150# cores, Hydraulic clamp and draw
INTERNATIONAL SB 13, up to 60# cores
INTERNATIONAL SB 12, medium sized cores
INTERNATIONAL SB 11, medium sized cores
6—OSBORN 193 up to 50# cores
OSBORN 2035-2 large sized cores

CORE GRINDERS
7—MILWAUKEE 70-9 & 70-12s
1—OWOSSO DE1-363 42" table

CORE OVENS TOWER
COLEMAN Vertical-Horizontal 9000# per hour
COLEMAN Vertical-Horizontal 6800# per hour

CORE PASTE OVENS
COLEMAN 28' Horizontal

CORE ROLLOVERS
INTERNATIONAL REDP Rollover 12" draw

CRANES
P&H 5 TON Electric Traveling DC motors 50' span
P&H 3 TON Electric Traveling DC motors 50' span
270' Crane Runway and Supports
10 Ton AMERICAN Railmaster Low headroom floor control
10 Ton SHAW BOX electric hoist

CUPOLA GUNS
2—BONDACTOR #1250
BONDACTOR #1000

DUST COLLECTOR
PARSONS 40,000 cfm. cloth bag type

ELECTRIC MELTING FURNACES
SWINDELL 9' Dia. Top Charge cap. 3 ton steel 5 ton iron per hour, 3500 KVA 13800 volt transformer, complete in place
1—"LECTROMELT" 2 TON Size Q 4000# per hour 1500 KVA 13200 Volt
1—"LECTROMELT" Size S 1000# per hour, 500 KVA 7200 volt
LECTROMELT 500#, Size T, 300-375 KVA 2300 V primary, Moore controls, G.E. circuit breaker.

ELECTRIC MELTING FURNACES
SINGLE PHASE
1—DETROIT "LFA" 350# shell 13200 V
1—DETROIT "LFC" 700# & 350# Tapered Shell 2300 V
2—DETROIT "LFC" 350# Tapered shell 7200V

FURNACE TRANSFORMERS
1—"LECTROMELT" 800 KVA, 12000 V., 3 phase
1—WESTINGHOUSE 2500 KVA, 11200 V., 3 phase
1—WESTINGHOUSE 2500 KVA, 13800 V., 3 phase

FURNACES NONFERROUS
CAMPBELL HAUSFELD Stary, pot type
1—HEVI-DUTY HD-181-S Pot type Electric
2—400# FISHER Gas Fired Tilting Furnaces
4—600# FISHER Gas Fired Tilting Furnaces
1—600# FISHER Gas Fired Stationary Furnace
FISHER RB100 gas fired crucible
3—CAMPBELL HAUSFELD gas fired 625# brass hand tilt

STROMAN 1000# Double Chamber dipout gas fired, complete controls

GRINDERS, SNAG
FOX 24" x 2" Single Wheel 10 hp.
2—HAMMOND 20" DE 10WR1 10 hp., 220-440 V.
1—HAMMOND 20" DE Porter Cable backstands 10 hp.
1—HAMMOND 24" x 2" x 12" 7½ hp., 220 V.
HAMMOND WR-2, 2 speed, 30" x 3" wheel

GRINDERS, SWING FRAME
MARSCHKE 24" x 3" x 12" 20 hp., 220 V.
U.S. 24" x 3" x 12" 15 hp., 220-440 V.
U.S. 20" x 2¼" x 6" 10 hp., 220-440 V.
2—MARSCHKE 3 hp., 12" wheel
1—B&D 7½ h.p.

GRINDERS, MISC.
PORTER CABLE BG8 Wet-Dry Belt
U.S. #70 Combination 20" disc and 20" x 3" x 1½" wheel

HEAT TREATING FURNACES
HOLDEN #202 Electrode Type, Bright hardening annealing 1850°
DESPATCH DT36 Pit type 42" x 40" Electric

HOISTS
YALE 5 TON floor control power travel
SHAW BOX 5 TON floor control Hand travel
4—INGERSOLL-RAND Air trolleys
1—500# INGERSOLL RAND LC-4
4—CLEVELAND 2000# Cab type hot metal carriers

LADLES
1—6000# Industrial Enclosed Geared Crane
1—5000# Modern Enclosed Geared Crane
3—2125# Industrial Enclosed Geared Crane

LADLE MIXING
4000# Industrial, Insulated

MOLD BLOWER
TACCONE TD4 24" x 32" flask

MOLDING MACHINES
JOLT SQUEEZE PIN LIFT
7—OSBORN 712 PJ, 18" x 21" Table
1—CHAMPION JSL10P 18" x 21" table 6" draw.

JOLT SQUEEZERS
2—INTERNATIONAL, LJS12 16" x 20" table
1—SPO, 110J Portable 17" x 20" table
4—CHAMPION, JS10P 18" x 21" table
2—OSBORN 275PJ

JOLT ROLLOVER DRAWS
1020 JOHNSTON & JENNINGS, 60" x 50" table
JOHNSTON & JENNINGS 918, 44" x 64" table, 20" draw, rollout table
2—750# HERMAN 20" x 30" table
20 x 8" INTERNATIONAL type G, 20" x 30" table
2—INTERNATIONAL RJ 20 x 12"
DAVENPORT 28A, 1500#, 29" x 40" Table

JOLT PIN LIFTS
2—INTERNATIONAL 1200—8 26" x 27" table, 3" draw

PIN LIFT PUSHOFF
CHAMPION 28" x 42" table
MILWAUKEE 620ND 20" x 24" table

MULLERS and MIXERS
1—#2 SIMPSON Unit Drive
2—#1 SIMPSON Mullers

SAND CUTTERS
1—ROYER MCZ-43

SAND SLINGERS
2—B&P Tractor 19" heads
B&P 2 speed 40/25 HP double belt
B&P Plate Feeder, 5 ton

SAWS, BAND
30" LAIDLAW, Metal Cutting hydraulic feed
30" TANNEWITZ, 3 hp., 440 V.
42" TANNEWITZ, 5 hp., 220-440 V.

SAWS, CUTOFF
DELTA Abrasive cutoff

SCALE
FAIRBANKS PRINTOMATIC 6250#

SCREENS
3' x 8' SIMPLICITY

SHAKEOUTS
3' x 5' SIMPLICITY
5' x 6' SIMPLICITY
5' x 10' LINK BELT

SPRUE CUTTERS
2—PERKINS #53 1¼" stroke
1—MILWAUKEE #85 TON

TESTING EQUIPMENT
ARLIN Automatic Rockwell, continuous type
COLEMAN 55 Spectrophotometer
BALDWIN SOUTHWARK 20,000 Tensile Tester w/load indicator and recorder

TUMBLING BARRELS
2—ROYERSFORD, 42" x 72", chain drive, late
WHITING 60" x 72" 20 hp. drive
SLY 42" x 42" x 64" 10 hp.

WHEELABRATORS
2—42" x 48" AMERICAN Skip Loader
1—27" x 36" AMERICAN Skip Loader

WOODWORKING—PATTERNSHOP
GARDNER 30" DISC and Spindle Sander
JONES SUPERIOR 48" Double Disc.
OLIVER 72DR Router or borer
PORTER 24" Facing Planer
BOICE CRANE 12" Planer
HESTON ANDERSON Swing Saw #5
DELTA 10" UNISAW
NORTHFIELD #4 Tilting Arbor Saw

EKSTROM CARLSON #540 Universal Router Mill Drill

WIRE STRAIGHTENERS
AMERICAN type H rod ⅜"-⅝" cap.
2—#2A CLIMAX ¼"

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BLOWERS

25—CENTRIFUGAL 16 oz., 2 to 5 HP
10—GE, WILBRAHAM-GREEN, FISHER Positive Pressure & Cent, Cupola Blowers

CLEANING EQUIPMENT & TUMBLING BARRELS

1—AMERICAN 20" x 27" WHEELABRATOR, Rubber Belt
1—AMERICAN 27" x 36" WHEELABRATOR TUMBLAST
1—AMERICAN 36" x 42" WHEELABRATOR TUMBLAST
1—AMERICAN 48" x 42" WHEELABRATOR TUMBLAST, w/loader
1—AMERICAN 36", Continuous WHEELABRATOR, side discharge, two head, Serial #A95643, New 1953. Used 2 months
1—PANGBORN TABLAST, 8' Table
1—SLY, Twin Unit, 40" x 24" Round, 10 HP
1—SLY, 68" x 32" Round
10—WHITING 36" x 36" x 72" w/gear head motors & brakes
1—WHITING 36" x 72" Round w/gear head motors & brakes

CONVEYORS

1—HEWITT ROBINS Vibrating, 18" x 10'
1—JEFFREY, 3 compartment, ingot mold
1—LINK BELT, vibrating, 80' x 24", w/exhaust hood
1—LINK BELT, CAR type mold, 114 cars, 403' track, car size 18" x 42"
2—LINK BELT, 30" Steel Apron Conveyors. 100' Centers
4—SAND ELEVATORS, Various sizes
6—SAND BELTS, 10' ctrs. to 140' ctrs.
2500 FEET—FOUNDRY TYPE ROLLER CONVEYOR—ALL SIZES

CORE BLOWERS

1—CHAMPION CB-12
10—DEMMLER #1, #2, #2A, #2K, #3K, #4E
3—INTERNATIONAL SB-13
3—OSBORN #91, #192, #91-10
1—RANDALL MODEL "A", Bench Type
1—TACCONE #4D, 10" Draw Stroke Cyl.

CUPOLAS

1—SKIP CHARGER for #9 Cupola with scale and buckets
1—WHITING Skip Charger for #5 Cupola

DUST COLLECTORS

1—AMERICAN WHEELABRATOR, Model #115KD, 20' L x 9' W x 9' H
10—ROTOCLONE #12, Type N, #14D, #16W, #20D, #24W, #30W

FURNACES—DIRECT ARC MELTING

1—250 Lb. LECTROMELT, Side Charge
1—500# LECTROMELT
1—3000 #/hr LECTROMELT
1—3000# HEROULT
1—3 Ton SWINDELL Hyd. Top Charge, 3000 KVA Transformer, Latest Type

FURNACES—INDIRECT ARC

1—350# DETROIT LFA
1—750# DETROIT LFY, Conical Shell
1—1000# DETROIT AA, 300 KVA
1—3000# DETROIT C, 500 KVA

FURNACES—INDUCTION MELTING

1—3 KW, AJAX, Lab type
1—20KW, AJAX SPARK GAP, High Freq.

1—100 KW Water Cooled, 300# Steel—NEVER USED
1—333 KW AJAX 1000#

2 NEVER USED WHITING NO. 7 CUPOLAS

72" shell dia., 55' high, 7 ton cap. Complete with charger, 2 I.R. blowers, batch hopper, holding ladle, and wet slag disposal system.

FRACTION OF COST

FURNACES—GAS & OIL

1—FISHER MNP, Gas Tilting, 1700#
1—500# FISHER, MNP, Gas Fired
1—400# FISHER, Oil, Stationary
1—250# FISHER, Oil, Tilting
3—Stationary, Gas, 250# to 1000#
1—HAUSFELD, Tilting, 1200# capacity
1—STROMAN, Gas, 1000# cap. Alum., auto control hyd. tilt.
1—STROMAN, Gas, 600 lb., "U" Type

FURNACES—HEAT TREAT

1—2' x 3' x 6' deep, gas fired, 1800° F.
1—4' x 4' x 10' deep Gas Fired Annealing
1—20" x 24" deep, L&N Homocarb electric
1—20" x 36" L&N Draw electric

GRINDERS

1—5 HP CINCINNATI, 2/60/110
1—5 HP GARDNER, 12" x 2½" wheels
1—7½ HP U. S. 2300-8400 RPM, 14" x 2" wheels
1—7½ HP U. S. 3/60/220, 20" wheels
1—7½ HP U. S. Model 66, 14" x 3" wheels
1—10 HP U. S. Model 65, 20" x 3" wheels
3—10 or 15 HP SWING FRAME, 22" wheels

MOLDING MACHINES

Jolt Rollover Pattern Draw

1—J & J #1020, 50" x 60" Table, 3000#
2—J & J #918, 44 x 54 Table, 20" draw
1—J & J #815, 30" x 40", 15" draw, 1200# jolt
2—HERMAN 10,000#, 48" x 109" table
1—HERMAN 6000#, 50" x 72"
1—HERMAN 3000#, 30" x 66" Table
2—HERMAN 1500#
1—HERMAN 750#, 30" x 36"
2—INTERNATIONAL, 13" x 17" table, 6" draw
1—OSBORN #602, 36" x 26", 900#
1—OSBORN #405, 3000#, flask size 64" x 50", 18" draw
1—OSBORN #42, 15" x 20", hand draw
4—TABOR 40" x 60", 1500 & 3000# capacity
1—TABOR, 30" x 40" w/air clamps, 1000#
1—TABOR 22" x 42", pattern draw, shockless, portable
1—TABOR, 20" x 30" w/air clamps, 1000#
2—TABOR, 14" x 16" Rockover

Plain Jolt

5—DAVENPORT, table sizes 24" x 27", 30" x 30", 1200# to 1800#
1—SPO #58P, 18" x 28" table, 800#

Jolt Pin Lift

1—HERMAN #4317, 22" x 30" table
1—J & J #681-C, 30" x 25" table, 600#
1—MILWAUKEE #1536, 32" x 38", 1500#
1—OSBORN #559, 25" x 30" table, 6" draw, 1200#
3—SPO #305, #307, 750 lb., 1500 lb.
1—TABOR, 17" x 20" table, portable
1—TABOR, 20" x 20" table, hand strip
1—TABOR, 20" x 24" table, 600#

Jolt Squeeze Pin Lift

2—INTERNATIONAL, PKL, 18" x 24" table, 12" sq.
1—MILWAUKEE #126, 21" x 27" table, 12" sq., 1200#
2—MILWAUKEE #163, 15" x 24" table, 11" sq.
5—OSBORN #712J, #712PJ, 18" x 28" table, 12" sq.
1—OSBORN #716PJ, 22" x 34" table, 1250#
5—SPO #2114P, 21" x 27" table, 600#
2—SPO #2136G, 21" x 30" table, 800#

Jolt Squeezers

4—INTERNATIONAL #10 LJS, 17" x 20"
1—MILWAUKEE #104-5JS, 17" x 21", port.
1—NICHOLS #12 F-P, portable, 600#
30—OSBORN #275J, #275PJ, 17" x 20" tables, 10" sq., 400#
2—SPO #110J, 17" x 20" table, port.
8—TABOR, 3" jolt, 17" x 20"

MATERIAL HANDLING

1—BYERS, Mobile Crane, BUDA Engine, 50' Boom, 5 ton w/magnet & bucket
1—CLARK, Fork Lift, Gas, 3,000 lb., capacity, Solid Tire

MULLERS AND MIXERS

1—B & P #30 Speedmullor, 3 cu. ft. batch
1—B&P #60 Speedmullor, 10 cu. ft. batch
1—B & P #70 Speedmullor, 15 cu. ft. batch with cooling and skip loader.
1—B & P, Conventional, SIMPSON type, 87½" Dia., arranged for cooling
1—MULLER Plaster & Mortar Mixer, 3 cu. ft. batch, Pneumatic Tires
2—SIMPSON #0, U.D. 3' Dia., never used
1—SIMPSON #1, 4' Dia., Style U.D. 4 cu. ft. batch, with loader
1—SIMPSON #1½ Style U.D., 4'6" Dia., 6 cu. ft. batch, with loader
1—SIMPSON #2, 6' Dia., 14 cu. ft. batch, Open Gear
1—SIMPSON #2 Style U.D., 6' Dia., 14 cu. ft. batch
1—SIMPSON #3, 8' Dia. Unit Drive, with loader 20-25 cu. ft. batch

LADLES AND POURING DEVICES

Bottom Pour

2—MODERN Crane Type, 55" H x 50" top
1—MODERN Crane Type, 60" H x 50" top

Lip Pour

1—WHITING 42" x 42" top dia., geared

Cylindrical

8—WHITING, 26" L x 25" dia., 1100# iron
7—WHITING 19" L x 25" dia., 600# iron
3—WHITING, 38" L x 28" dia., 2200# iron

Pouring Devices

7—WHITING, 850# to 2000# gross cap.

OVENS

1—ALLIS CHALMERS Dielectric Core Oven, Type 15 CH, 650# cores/hr.
1—COLEMAN, Gas, 2 Comp. and 5 drawers, OD. 22" x 12' x 10'
2—GENRICH, Elec., 3 drawer, preheating, auto-control, 9' H x 8' W x 9'7" L
1—KOCHS BROS. Electric, 36 x 40" x 64" inside
2—ROSS, Gas, 2 compartment, recirc., rack type, 6½' x 14' x 7'

SAND CONDITIONING

2—B & P Screenarator, Model "S"
1—JEFFREY Sanditioner, Portable, 10-15 tons/hour, 2 H.P. Motor
1—NATIONAL ENGINEERING SAND-PREPARATOR Unit w/permanent magnet pulley
2—ROYER, NC-2, 10-15 tons/hr., 1½ HP Motor
1—ROYER PREPARATOR, Comb. Model NDC, 25 Ton/hr. Scrap removal, 8' x 8' hopper
2—ROYER, NDP 15-25 tons/hr., 2 HP
1—ROYER, NRS, 40-60 tons/hr., 5 HP

SAND CUTTERS

1—AMERICAN, 15 HP, 96/78 Reel
1—AMERICAN, 10 HP, 48" Reel
1—MOULDERS' FRIEND, 61" brush, reversing control, Like New

SAND SLINGERS

1—B&P Tractor Type, 19" head
1—B&P Tractor Type, 16" head

SHAKEOUTS AND SCREENS

1—HEWITT ROBINS, Vibrex screen, 3' x 8'
3—SIMPLICITY, 3 x 8, 5 x 8, 8 x 10

MISCELLANEOUS

1—HOWE WEIGHTOGRAPH SCALE, Model 1700
1—KANE & ROACH WIRE STRAIGHTENER, Model DX-5
1—PATTERSON-KELLEY Twin Shell Dry Blender, 3 cu. ft. capacity
FLASKS, CORE PLATES. All Sizes
500,000# Hyd. Compression Testing Machine
4' FOOTE-BURT Horiz. Bar Mill
5 Ton WELLMAN Charging Machine
No. 2 HILLES & JONES Bar Shear

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AIR & ELECTRIC HOISTS

15—DETROIT Air Hoists, 1, 1½, 5 ton cap.
2—P&H and DETROIT Model LHR, 5 ton.
20—THOR air hoists, ½, 1 & 2 ton cap.
85—INGERSOLL RAND Air Motor Type. Sizes RC-5, A, B, C, ¼, ½, 1 ton.
1—SHAW BOX 2 ton load lifter.
2—YALE ½ ton.

BUCKET ELEVATORS

12—LINK BELT & JEFFREY, 30, 40, 50, 60 ft. ce, 10 x 7, 12 x 7, 14 x 7 buckets.

CUT-OFF MACHINES

2—AMERICAN H-Rod Straighteners.
1—DeWALT ME 2, 10 HP, 24" Blade.
1—GROB Band Saw, Type 08-36.
TABOR C10AF—18" wheel, 10 HP.
3—TESSEMER H & I Spur Cutters.

CORE BLOWERS

3—CHAMPION Model CB-10, CB-18, & CB-400. From 10 to 300 lb. Cores.
22—DEMMLER Model Nos. 1, 1E, 2, 2E, 2K, 3, 3E, 3K, 4, & 4E. From 10 to 100 lb. Cores.
7—INTERNATIONAL Model SB-11 & SB-13, SB-15H, 15 to 30 lb. Cores.
6—OSBORN Nos. 91, 92, 192 and 193. From 10 lb. to 75 lb. cores.
3—MILWAUKEE #3A Bench Type.
1—SPO Model SC-10-DM Shell Core Blower.
1—SAN-BLOW, Model CB-40-B, 40# Cores.

CORE OVENS

1—CARL MAYER 2-Compartment, oil fired, I.D. 7' W x 14' deep x 8' H each.
1—INDUSTRIAL "Revolving Carriers" continuous, 18" x 80" trays.
1—THERMONIC Model M800A Dielectric. Cap. 900#s per hour.
1—YOUNG BROS. 6' x 6' x 9' double door, rack type, gas fired.

CUPOLA BLOWERS & EQUIP.

1—SPENCER 150 HP 7500 CFM 48 oz.
6—I & R Centrifugal 30, 50, 85 and 100 HP, 3500 to 10,500 CFM w/blast gates.
1—ROOTS 7,000 CFM, 50 HP motor.
1—ROOTS CONNERSVILLE Type RCS Size 20 x 60 w/75 HP motor.
1—MODERN No. 3½ Cupola.
1—CUPOLA Bondactor, style 1205-L.
1—WHITING No. 6 Cupola.

ROTO-CLONES WET TYPE

9—AMERICAN AIR FILTER Type N&W, Sizes No. 10, 20, 24, 27, & No. 30, w/sludge ejectors, cap. to 30,000 CFM.

ELECTRIC MELTING FURNACES

1—AJAX 20 KW Induction Unit.
1—TOCCO 20 KW Induction Unit, 9600 cycles.
3—AJAX No. 100 & 300 Furnaces Only.
1—DETROIT Size CM — 4000# Cold Charge, 8000# Molten Metal, w/1000 KVA transformer.

GAS & OIL FIRED FURNACES

23—LINDBERG FISHER Model MNP electric Tilting. Sizes 150, 400, 600, 1000, 1700, 2000 & 2400#, aluminum capacities. Gas or Oil Fired.
29—LINDBERG FISHER & CAMPBELL HAUSFELD Stationary. Sizes 100, 150, 200, & 550 capacity. Gas or Oil Fired.
1—STROMAN Model JC Cradle Type Hydraulic tilt, 2000# capacity. Iron.
1—STROMAN, Model "U," 600# Reverberatory Hand Tilt.

HEAT TREAT FURNACES

1—DESPATCH Model DT-26, 38" diameter x 26" height, gas fired recirculating, 1250°, pit type.
1—SURFACE COMBUSTION, 54" x 96", box-type, gas fired, 1850° F.

GRINDERS

Swing Frame

1—MARSCHKE 20" x 10" wheel, 10 HP.
2—FOX No. 6, 24" x 10", 15 HP.
3—MARSCHKE 24" x 3" wheel, 15 HP.
2—U. S. ELEC. Model 24, wheel 24" x 3".
1—MUMMERT-DIXON #2420, wheel 24" x 3".

Snagging

2—U. S. #64, 20" x 3", 7½ HP, 4 speed.
2—SAFETY #174, 24" x 3" wheel 10 HP.
2—MARSCHKE 24" x 4" wheel, 20 HP.
1—U. S. #65, 30" x 3", 30 HP, 4 speed.

Core

2—MILWAUKEE 70-12, 70" dia. table.
1—STONEY Core Grinder. 16" dia. Wheel.

Horizontal Disc

GARDNER No. 124—53" wheel, 20 HP

LADLES

17—MODERN & WHITING Cylindrical Ladles, 275, 1500, 2450, & 3000 lbs. capacity. All Enclosed Gears.
12—MODERN Model F-9 and FA-9 Pouring Devices, with ladles 400 to 800 lbs.
37—MODERN & WHITING Lip Pour, Enclosed Gear, 1200, 1600, 2000, 4000, 6000, 7000, 8000, & 80,000 lbs. capacity.
7—MODERN & WHITING Cylindrical Mixing Ladles, 2 & 3 ton capacities. Electric & Manual Tilting.
7—WHITING Bottom Pour 4 ton.

MOLDING MACHINES

Jolt Squeezers

37—OSBORN, SPO, MILWAUKEE, Portable & Stationary, 10" Squeeze Cyl.
13—OSBORN, MILWAUKEE & SPO Portable & Stationary, 12" Cylinder.

Plain Jolt

1—HERMAN 40" x 58" table, 3000# cap.
1—HERMAN 8' x 12' table, 32,000# cap.
1—J&J 50 x 72 Table—5000# cap.

Jolt Rollover Pattern Draw

1—DAVENPORT 28-SA, 29" x 40" table.
2—DAVENPORT 40-SA, 42" x 50" table.
3—HERMAN 1500 lb. Series, 26" x 45".
1—HERMAN 750 lb. Series, 20" x 30.
2—HERMAN 4000 lb. Series, 40" x 60".
14—INTERNATIONAL Type G, Sizes 20" x 8" 24" x 10".
1—INTERNATIONAL RES Size 15" x 8".
2—J & J #612, 24" x 30" Table.
4—J & J #918, 44" x 54" Table.
1—J & J #815-B, 30" x 40" Table.
1—MILWAUKEE #167, 32" x 33" Table.
1—MILWAUKEE #60B-3, 60" Flask.
10—OSBORN #40 and 42 Core Rollovers.
1—OSBORN #442, 21" x 31" Table.
2—OSBORN #242W, 29" x 42" Table.
12—OSBORN #601 & 602, 30" & 36" Wide Flask, 10" draw, 750 lbs Cap.
2—OSBORN 643 Table 35 x 50—2000#
1—SPO #413D, 24" x 25" Table.
1—SPO Model 9336, table size 22" x 28".
1—SPO Model 508, table size 28" x 30".
1—SPO 506—24" x 30" Table 10" Draw.
3—TABOR 30" x 40" Table, 12" Draw.
4—TABOR 22" x 32" Table, 10" Draw.

Jolt Pin Lift

3—INTERNATIONAL JDP 1600 X 10" draw, 36" x 36" table.
2—OSBORN #559, 25" x 30" Table.
2—MILWAUKEE #2542, 38" x 42" Table.
1—SPO #3058, 22" x 28" Table.
1—SPO #3102—42" x 50" Table.

Pin Lift

9—INTERNATIONAL & B & P Speed Draw. Used with Sand Slinger. Cap. 600 to 2000 lbs., up to 30" x 40" flasks.

Jolt Squeeze Pin Lift

1—MILWAUKEE #125, 21" x 27" Table.
1—OSBORN #712-V, 18" x 26" Table.
2—OSBORN #710-J, 17" x 21" Table.
4—INTERNATIONAL PKL, 17" x 26".
1—INTERNATIONAL PK-20, Size 20" x 8".
1—OSBORN 716 PV—22" x 34" Table—16" dia sq cyl.

CONVEYORS

Steel Apron

9—JEFFREY & LINK BELT 24", 30", 36", widths. Lengths built to your specifications, with reducers & motors.

Oscillating & Vibrating

1—LINK BELT 48" x 154', 20 HP Motor.
7—JEFFREY TAYLOR No. 5 Vibrating Feeders 24" wide x 7'.

Roller

2500' MATHEWS 6", 12", 18" & 20" wide. 2⅞" dia. roller, 4½" hex shaft centers, 4" channel.
500—MATHEWS 12" & 36" wide, 3½" dia. 1" hex shaft on 6' centers, 6" channel.

Meld

3—LINK BELT 88 Cars 20" x 48", 350' track, with automatic dumping.

Belt

LINK BELT & JEFFREY 18", 24" & 30" wide. Flat or trough idlers, all Timken bearings. Built to your specifications. Can be equipped with molders hoppers & Ploughs.

MOLDERS HOPPERS & STORAGE BINS

7—NATIONAL & LINK BELT Storage Bins, 60 to 150 tons cap.
42—MOLDERS Hoppers 1½ ton cap.

SAND MULLERS

1—B & P #40 Speed Muller, 6 cu. ft.
1—B & P #50, SpeedMullers, 9 cu ft.
1—B & P #60, Speed Muller, 12 cu. ft.
2—B & P #70, Speed Mullers, 18 cu. ft.
2—CLEARFIELD No. 610 w/skip hoist loaders, 10 to 14 cu. ft. batch.
1—DRAVO-DOYLE 6 cu. ft. cap. Port.
1—LINK BELT 48" x 8' Paddle Type.
1—PEKAY No. 160-1-24 Mixer Muller, single stage for 24" belt, 230 TPH
1—SIMPSON No. 1H Style UD—500#
1—SIMPSON #1½, Style UD, 700 lb., w/loader.
2—SIMPSON #2, Style C, 1500# w/loader.
2—SIMPSON #2, Style UD, 1500# w/loader.
3—SIMPSON #3, Style C, 3000 lb.
3—SIMPSON #3, Style UD, 3000 lb.
2—Mixer Muller, 6 cu. ft. paddle type.

SAND PREPARATORS

2—NATIONAL #3 Style C Aerators.
6—ROYER Complete conditioning units including Shakeout, Belt Conveyor and Sand Blender.
6—B & P Screenerators, Models S, M & L.
8—ROYER Models, NC-4, NDS, NDP.
6—AMERICAN Sand Cutters, Model M, Sizes 79/60, 89/70, 99/80. All late.
4—AMERICAN Model AA and AM, 45" & 60" Cutting Blade.
1—ROYER S-522-9M Scrap Control 60 ton per hour capacity.
1—AMERICAN "Sand Master," 162"/76" cutting blade—1952.
1—MOULDERS' FRIEND 60" Brush.

SANDSLINGERS

1—B & P Motive Jr., 300 cu. ft. tank.
2—B & P Tractor Type 19" head & 16" head, 13' arms. Magnetic towers.
6—B & P Models DB Stationary Sand Slingers, 16", 19" and 22" heads, with 20, 25, 40 and 50 HP motors. All late.
2—B & P Swing Type Slingers 19" head.
4—B & P 8 ton plate feeders.
2—B & P 35 ton capacity plate feeders.

SHAKEOUTS & SCREENS

2—LINK BELT 5' x 10', 6 ton cap.
1—SIMPLICITY 4' x 10' Model D.
1—SIMPLICITY 5' x 8', Model D.
1—NATIONAL ENG. 5' x 8' Hex Screen.
1—HEWITT-ROBINS 36" x 78" Vibrex.
1—SIMPLICITY 4' x 10' Model B, Single deck sifter screen, 10 HP motors.
1—HEWITT – ROBINS Vibra - Feeder 30" wide x 60' long.
2—ROBBINS 3' x 4' JF6—2000#
2—ROBBINS 3' x 5' JF6—2000#
1—ROBBINS 4' x 6' JF9—8000#
1—ROBBINS 4' x 8' JF9—10,000#
1—ROBBINS 6' x 10' JF11—20,000#
1—ROBBINS 8' x 10' JF11—30,000#
1—SIMPLICITY 4' x 6' Model B.

SAND BLAST EQUIPMENT

1—AMERICAN 36" x 42", w/skip Hoist.
2—AMERICAN 48" x 42", w/skip Hoist.
1—AMERICAN 27" x 36" w/skip hoist.
1—AMERICAN 48" x 48".
1—AMERICAN No. 1-S Suction Cabinet.
1—AMERICAN #3 Tablast, 4—48" tables.
1—AMERICAN #1 Tablast, 7-14" tables.
1—AMERICAN No. 2A multi-tablast.
1—AMERICAN 20" x 27" Rubber Belt Tumblast.
1—PANGBORN #45, type MT Sand Blast Room 10' L x 8' W x 6' H.
1—PANGBORN No. 53 type EN-2 blast cabinet with dust collector.
1—PANGBORN Model 6-LF, 6' diameter plain table with dust collector.
1—PANGBORN #44NF Shot Blast Room 10' x 9' x 9'.

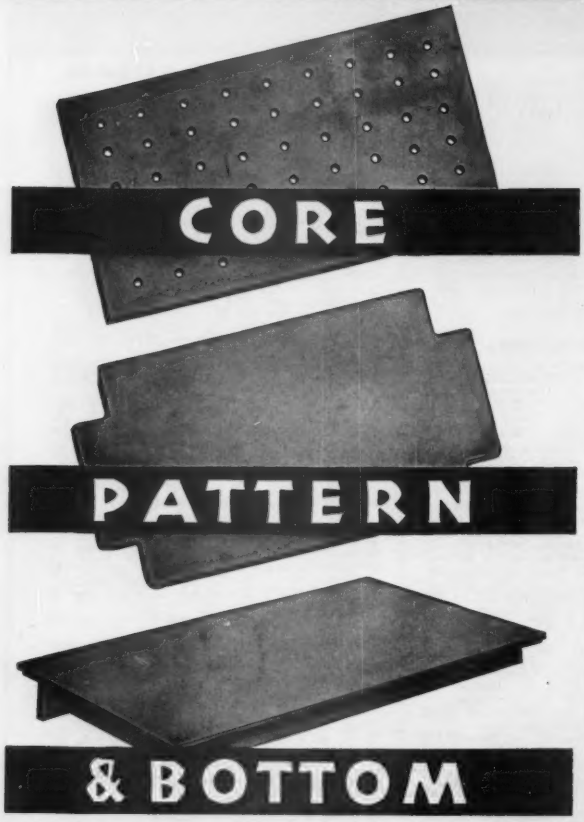
TUMBLING BARRELS

13—SLY & WHITING. All late type units, with gearhead motors and built in magnetic brake, Timken bearings. Following sizes: 30" x 48", 24" x 48", 30" x 60", 36" x 84", 42" x 72", 48" x 72", 48" x 96", 72" x 120".

AAA MACHINERY & EQUIPMENT CO.

15539 SARANAC ROAD—CLEVELAND 10, OHIO—CALL LI. 1-6545

MOLTRUP



PLATES

. . . . . for accurate casting results specify Moltrup Plates! They *stay flat* and *last longer* than other types—for Moltrup employs a special flattening process designed to permanently eliminate buckling or bending.

Consequently your investment goes further and that *all-important profit-margin* increases. Plates are made to your specifications—we welcome the opportunity to furnish complete information.

MOLTRUP STEEL PRODUCTS COMPANY
BEAVER FALLS, PA. (Pittsburgh District)
Sales Offices in All Principal Cities

MOLTRUP

Are You Looking

for

Machineability?

Chemical inertness?

High thermal conductivity?

High temperature stability?

Resistance to thermal shock?

. . . then consider GRAPHITE — it has many unique qualities.

We are specialists in graphite specialties. Our technicians will be glad to work with yours.

ELECTRODE GLC DIVISION
GREAT LAKES CARBON CORPORATION
18 EAST 48TH STREET, NEW YORK 17, N.Y.

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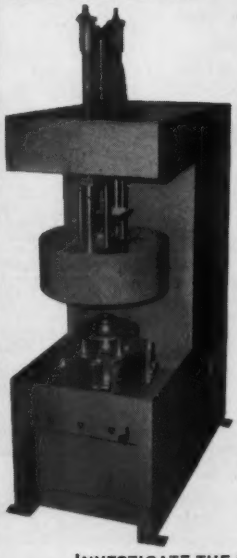
CENTRIFUGAL CASTING MACHINES . . . WITH STANDARD PARTS AND EQUIPMENT CAN BE . . . CUSTOM BUILT



We make machines capable of producing castings weighing **MANY TONS** as well as machines to produce castings weighing a **FEW OUNCES.**

•

Some machines are designed for long-run repetitive production, while other special machines are most suitable for short runs of varying sizes and types of castings.

•

WE FURNISH INFORMATION ON **HOW** TO MAKE CENTRIFUGAL CASTINGS

INQUIRIES INVITED

INVESTIGATE THE POSSIBILITIES OF MAKING YOUR CASTINGS CENTRIFUGALLY . . . TODAY.

CENTRIFUGAL CASTING MACHINE CO.
P. O. BOX 947 TULSA 1, OKLAHOMA

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Main 1-8260

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NEW EQUIPMENT DIGEST • AUTOMATION

FOUNDRY is edited primarily for management, production, technical and purchasing personnel in foundries. A copy is sent at no cost to each metal casting plant in the U. S. and Canada employing 20 or more workers and to selected smaller foundries. Additional copies are sent to each foundry to the extent necessary to serve key foundry personnel on an individual or routed basis. A limited number of copies is supplied at no cost to educational institutions.
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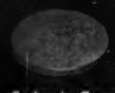
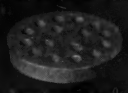
BPA NBP

FOR BETTER CASTINGS...

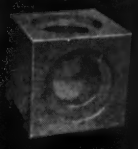
UNIVERSAL refractory gating components



Splash Cores



Strainer Cores



Determine proper gating faster, eliminate slag inclusions, stop rejects, reduce cleaning room time, and lower production costs. UNIVERSAL *refractory* gating components will help you do this, and at less cost than producing your own from sand. Send specifications for price and delivery quotations, or call MA 6-4912

WRITE TODAY FOR CATALOG LISTING SPECIFICATIONS OF STANDARD GATING COMPONENTS

Pouring Tubes

UNIVERSAL CLAY PRODUCTS CO.

1515 EAST FIRST ST. • SANDUSKY, OHIO

Circle 668 on Page 117

PENN BUCKETS

Careful balancing makes Penn Buckets self dumping when loaded and self righting when empty. Welded construction prevents "clinging" makes them empty easily and completely.

WRITE TODAY FOR NEW BULLETIN AND DIMENSION SHEET

No. 4-A Self-Dumping

MEMBER FEMA

PENN IRON WORKS, INC.

READING, PENNA.

Circle 670 on Page 117

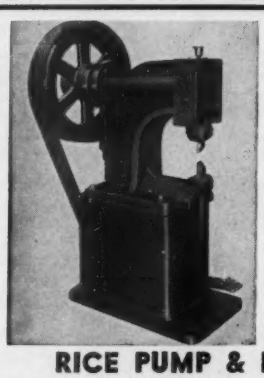
IRON AGE says:

". . . one of the best books currently available."

VACUUM MELTING

Here is the first comprehensive work on a technique grown from a laboratory curiosity to an operation of increasing commercial importance. Includes valuable material on vacuum melting processes never before presented in a single volume with special sections devoted to induction melting, arc melting and stream degassing. Hailed as one of the most important contributions by those concerned with the commercial and technological progress of the metal industry. Required reading for metallurgist, student, educator, executive. 136 pages. Illustrated. $7.50. Send check or money order:

VACUUM MELTING • 1383 Panther Road • Rydal, Pa.



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Sprue Cutter

for

Non-Ferrous Foundries

- Cuts Sprues and Gates with One, Swift, Sure Stroke.
- Does away with tedious hand labor.
- Speeds flow of work through cleaning department.
- Built for years of Rugged, Low-Cost Service.
- 2 Sizes, ¾" and 1¼" square. Built-in electric motor or belt drive.

Write for Illustrated Bulletin

RICE PUMP & MACHINE CO.

222 Park Ave. Belgium, Wis.

Circle 671 on Page 117

MURPHY PISTOL SPRAYER

Forces blackening into pores and pockets of molds. Sprays Silica wash, oil, or water equally well. Use it also to sand blast or as a blow gun.

Standard of the foundry field for over 50 years. Stocked by leading foundry supply houses. Guaranteed by . . .

2673

JAMCO

JAS. A. MURPHY & CO., INC.

1425 EAST HIGH STREET, HAMILTON, OHIO

FOUNDRY

EDWIN S. CARMAN, INC.

LEE ROAD AT MAYFIELD

CLEVELAND 18, OHIO

A COMPLETE FOUNDRY SERVICE

MODERNIZATION

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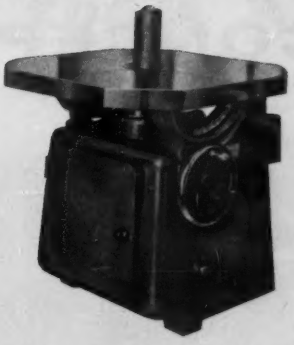
Circle 669 on Page 117

OLIVER Oscillating-Tilting Spindle Sander for those hard-to-sand edges of patterns

A heavy-duty Spindle rotates and oscillates to give you smooth, accurate patterns



This Oliver sands difficult patterns smoothly, quickly. Its 1-inch spindle rotates at 1800 r.p.m. and oscillates 1⅛" with 56 strokes a minute. Spindle tilts up to 45° toward operator, 5° away from him. Takes drums 2", 4", 6" diameter, 9" long. Spindle has 3" vertical adjustment to provide full use of sanding area. Write for Bulletin No. 381.

Oliver makes an extensive line of Disk and Spindle Sanders and other woodworking equipment for pattern shops

OLIVER MACHINERY COMPANY
Grand Rapids 2, Michigan

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It's what's INSIDE that counts!

Most storage bins look good on the outside, BUT . . .

1. Have they been built to meet the required method of loading?
2. Is the storage area and inside wall built to favor the characteristics of the material to be stored?
3. Will the flow of the material meet the required volume and rate of flow at the point of discharge?

We at Neff and Fry make it a point to see that all three requirements are in balance.

It's the **STAVE** that makes the difference!

N & F

NEFF & FRY COMPANY
214 Elm St.
Camden, Ohio

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Only from LENNOX industrial heaters

400,000 to 2,000,000 Btuh • VERTICAL OR HORIZONTAL APPLICATIONS

1. 4-PASS COUNTER FLOW!
2. MASTER CONTROL PANEL!
3. STAINLESS STEEL COMBUSTION CHAMBER!
4. DOUBLE CASING WITH METAL RADIATION SHIELD!

Write for Engineering Data:

LENNOX Industries Inc.

Dept. F-6
1701 East Euclid
Des Moines, Iowa

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EMPIRE*

"THAT GOOD" FOUNDRY COKE

DEBARDELEBEN COAL CORPORATION
2201 First Ave., North • Birmingham 3, Ala.
Phone: ALpine 1-9135
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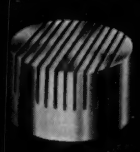
SLOTTED CORE BOX VENTS



X-TRA DEEP HEAD .156 Wide Slots .014

SHALLOW HEAD .031 Wide or Narrow Slots .014 .010

DEEP HEAD .093 Wide or Narrow Slots .014 .010

CO_2 TYPE DEEP HEAD .093 Wide or Narrow .014 Slots .010

Manufactured by C.M. SMILLIE & CO. 1124 WOODWARD HGTS FERNDALE 20 MICH

INSERTING DRILL

- MOST ECONOMICAL METHOD for INSERTING CORE VENTS
- CORRECT DEPTH
- UNIFORMITY OF HOLES
- FASTER INSERTION OF VENT

VENT CLEANER
- FOR CLEANING SLOTS
- MADE OF TEMPERED STEEL
- EASY TO USE

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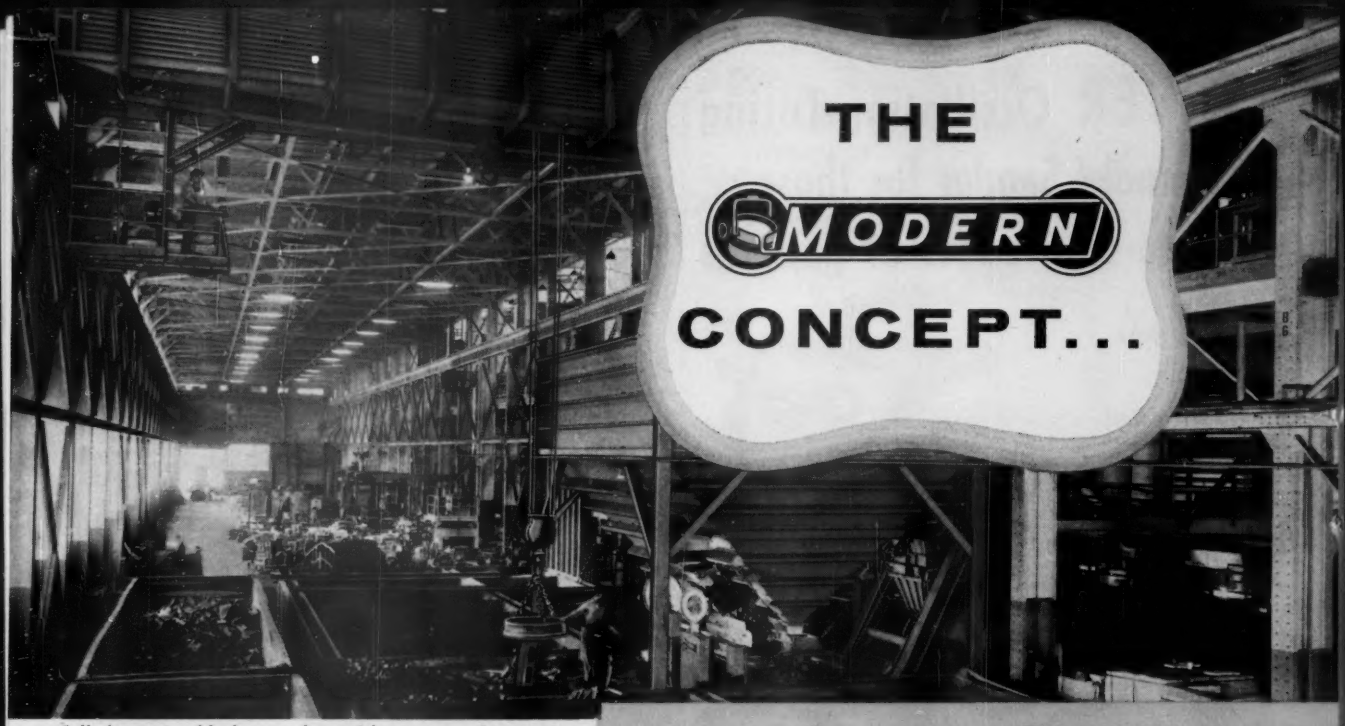
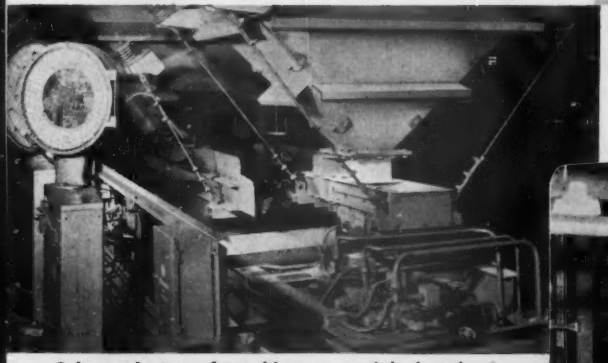


THE MODERN CONCEPT...

Full-size motor blocks are charged by crane and magnet through scale-mounted, weigh hopper to small-cone, orange-peel bucket.

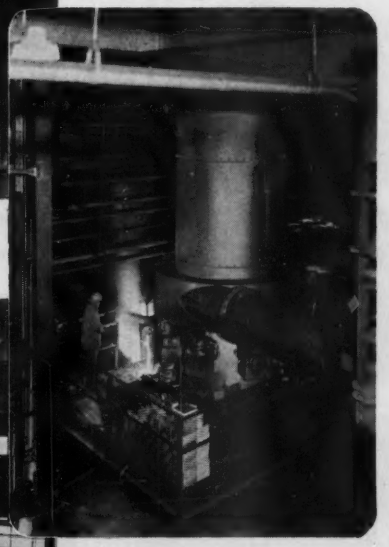
in Cost Cutting!

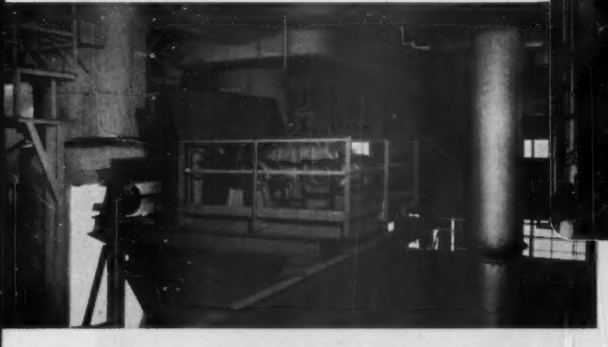


Coke and stone from bins are weighed and recorded automatically.

Upper portion of charger indexes to serve more than one cupola.

Slag is granulated in water and flows to sludge tank.





Modern cupolas with continuous-tapping, front slagging spouts.

Automization of the charging, melting and pouring cycle may follow set patterns. Still every installation is different:

DIFFERENCES IN —

- *lengths of melting time and types of iron may alter cupola designs . . .*
- *cupola locations and yard conditions call for differences in swiveling and indexing of the charger . . .*
- *charging cycles determining the stock bin and feeder equipment.*
- *automatic weighing and recording instruments — inventory the components, eliminate human error and insure uniformity of metal . . .*

In all these and other ways MODERN's single responsibility for engineering, fabrication and erection is cutting the tonnage costs for the Bullard Company. Other case studies in catalog 147-C . . .

Circle 678 on Page 117

MODERN EQUIPMENT COMPANY, Dept. F-6, Port Washington, Wisconsin

Mail to my attention:

- ☐ Catalog 147-C on charging and melting . . .
- ☐ Catalog 150 on cranes, and monorail systems . . .
- ☐ Catalog P-152-A on ladles and pouring . . .

Company.....

Street.....Box.....

City.....Zone.....State.....

My Name.....

NEW... FOR YOU FROM STEVENS

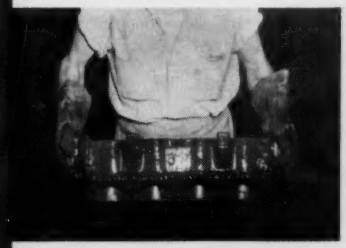
THESE NEW PRODUCTS WILL IMPROVE YOUR FOUNDRY OPERATIONS

IGNICOAT—FAST DRYING MOLD SPRAY

Eliminates lengthy drying of mold coating by torch or oven. Can be sprayed, brushed or swabbed. Ignicoat mixes rapidly with isopropyl alcohol and contains the proper percentage of binder to insure good film adherence to the sand. When ignited, burns with a gentle flame. Molds may be closed and poured as soon as burning stops.

RED-SKIN CORE COATING

Does not run, streak, tear-drop or pile up at the edge of the core. It is a refractory type core coating that insures clean peel of sand from castings. The new Stevens Red-Skin reduces costs and aids in the production of better castings when used on molds and cores for steel, grey iron and non-ferrous metals. Red-Skin has deep penetration and seals several layers of sand, to prevent metal penetration.

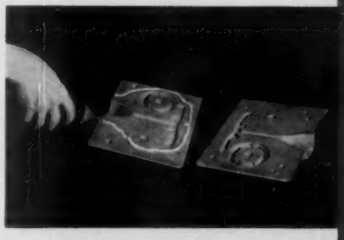


GRAPH-KOTE COATING

Graph-Kote is a "short" coating which means a sharp dip line. It coats only where the coating is needed, assuring accurate fitting of core prints and assemblies. Cores can be dipped faster and its even uniform coating gives ample coverage to produce clean castings. In its original paste form, Graph-Kote can be stored indefinitely in the original Stevens polyethylene lined drums.

NEW IMPROVED FASTICK LIQUID CORE PASTE

Has very rapid air or oven drying qualities. Gives excellent results with resin-bonded cores and shell molds. Permits elimination of clamps on shell mold halves. Strength is not reduced at high temperatures. As a time saver, Fastick will reduce your costs as it is mixed and ready to use when received.



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FREDERIC B.
STEVENS
INCORPORATED
EVERYTHING FOR A FOUNDRY
DETROIT 16, MICHIGAN

Circle 552 on Page 117

WRITE TODAY FOR TRIAL ORDER OR AN "IN-PLANT" TEST ON ANY OF THESE NEW STEVENS PRODUCTS

Another BARTLETT-SNOW CLEVELAND 5, OHIO **INSTALLATION**

In Large Midwestern Steel Foundry

Complete facilities for sand handling, screening and conditioning; mold and flask handling; shakeout with dust control.

THE C. O. BARTLETT & SNOW COMPANY

Designers, Engineers, Fabricators and Erectors of Foundry Equipment

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